

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Braemar, County of Aberdeen, in Lat. 57° 4', Long. 2° 24' W, Distance from Sea 60 miles.
Height of Cistern of the Barometer above Mean Sea-level 114 feet, above Ground 5 feet. During the MONTH of January 1870.
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.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		9 h. A.M.		9 h. P.M.		Protected in Shade, &c. 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.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		Barometer.	Atmos- phere.	Barometer.	Atmos- phere.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.		Amount (0-10), and Species.	Amount (0-10), and Species.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteor.
ci-cu.	" cirro-cumulus.	n.	" nimbus.
cu.	" cumulus.	r.	" rain.
cu-s.	" cumulo-stratus.	h. r.	" heavy rain.
d.	" dew.	c. h. r.	" continued heavy rain.
f.	" fog.	s.	" stratus.
fr.	" frost.	sc.	" scud.
h. fr.	" hoar-frost.	sl.	" sleet.
h. h.	" haze.	so. h.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
h. h.	" hail.	sqs.	" squalls.
l.	" lightning.	t.	" thunder.
l. cl.	" light clouds.	t. s.	" thunder storm.
l. sh.	" light showers.	w.	" wind.
l. co.	" lunar corona.	g.	" gale of wind.
l. 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 for Temp. (Col. 2), = $28.620 - 0.009 = 28.611$
"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = $28.640 - 0.009 = 28.631$
Mean at Station, corrected, and at 32°, = 28.622
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 29.824
Highest Reading, corrected for Index error, on the 19th, = 29.414
Lowest Do. Do., on the 8th, = 27.468
Difference, or Monthly Range, = 1.946

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 17th, = 47.5
Lowest in Month, corrected for Index errors, on the 24th, = 15.8
Difference, or Monthly Range, = 31.7
"Corrected Mean" of all the Highest, (Col. 5), = 37.8
"Corrected Mean" of all the Lowest, (Col. 6), = 26.6
Difference, or Mean Daily Range, = 11.2
** Calculated Mean Temperature of Month, = 32.2
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 2th, = 61.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 52.2
Lowest at Night, Black Bulb, (corrected for Index errors), on the 24th, = 13.7
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 24.9
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 31.85
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 30.27
† Computed Temperature of Dew-Point, = 26.4288
† Do. Elastic Force of Vapour, = 1.43154
† Do. Weight of Vapour in a Cubic Foot of Air, = 79.86
† Relative Humidity, (Saturation = 100), = 79.86
RAIN fell on 8 Days; Amount in Inches, = 0.80

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Mean Force.
A.M.		0	3	1	3	4	12	6	2	0.07
P.M.		1	1	0	2	3	20	2	2	0.10
Mean.		0.2	1.2	4.16	4.2	0	0.08	0.01	0.01	

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

Observations made and
Return verified by

(Signed)

WITH REMARKS ON THE USE OF INSTRUMENTS

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 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. Show must be heathowed 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 after to be used, without being *re-tested*. The self-registering, and especially the "*Minimum*," Thermometers, self-registering, and especially the dry bulb of the Hygrometer. They

The *Hygrometer* consists of two *Thermometers* usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Determinations," Observers are specially requested to attend to the following conditions:—

The bulbs must *hang down* by at least an inch free from the frame and frame to which they are attached;—the frame must be so scaled and framed as to permit the bulb to swing freely, as well as will bring the tubes forward by an inch, from the board on which it may be suspended; the water-cap must be covered, and placed to the side, and a little below the level of the rest bulb;—in no case under the bulb;—the mistin must be set in medium fineness, and fastened at the neck of the bulb by a cotton thread, which also supplies it w water. It must be seen to be

the observer. That the mistral is always *calon*, and *mios*, and *water pure*. In frosty weather observation is a matter of intricate delicacy, and must be made with great care. The only mistral moistened by immersion from 15 to 30 centimetres below the horizon of observation. From the mist of ice thus formed exportation will proceed as from the most cold in ordinary circumstances.

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

Method 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, on this scale, is the tip of the index or column of mercury. The thermometer ought to be taken to tenths of a degree, and noted in decimal notation. Thus the thermometer will be read—39.9, 40.0, or 40.1, etc. Again, 40.4, 40.5, or 40.6 degrees, according as it indicates a fifth, sixth, or seventh of a degree. It is not necessary to note the hundred, 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 noted respectively. So also 40.7, and 40.7.5, or 40.8 degrees respectively. Reading, Fahrenheit's & *Max.* and & *Min.* Thermometers, the

indications of that end of the Universe which is next to us are strikingly different from those of the far end. Readings of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

3 Wind.—On the 24th and extending to 9 P.M. on the 26th a wind-wave ought to be elevated 12 feet at least above surrounding objects. When it settles instantaneously, the mean direction must be taken; and when it is stationary, the direction of the wind is best; reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

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

The Council recommended that every observatory be fitted

insisted with a Hemslerian-Cup Anemone-like "sea-egg" as the first instrument which shows the nature of the Wind that passes over dry land; from which also the velocity of the Wind at the time of observation may be ascertained. Not indicating the force of the Wind, as any particular hour of observation, the *Wind* monitor is also recommended; the method of *Wind* and *Wind* monitor by such tables as that given in the schedule is, to my best belief, unsatisfactory. Many causes conspire to produce anomalous results. They arise, partly, from the defective nature of the key of the instrument, and partly from the nature of the instruments used. It is, indeed, difficult to obtain an unequivocal position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the surface of the ground in its mouth. The rain-gauge ought to be

Snowflake may, for convenience, be registered in the rain column under the following conditions:—When a Snow shower occurs, it must be noted in the “*Snowflake*” and the letter S prefixed to the depth of water received in the 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 whirling 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

BOOK-POST.

1

[illegible][illegible]

Leaf.	Divested of Leaves.	CROPS, mentioning variety.	So Pl
		Barley, . . .	
		Bere or Bigg, . . .	
		Oats, . . .	
		Wheat, . . .	
		Beans, . . .	
		Pease, . . .	
		Potatoes, . . .	
		Turnips, . . .	
		Rye Grass, . .	

[illegible]

OBSERVATIONS	
FOREST TREES.	Fl.
lder,	
h,	
ech,	
ech,	
m,	
rch,	
me,	
k,	
eamore or Plane,	

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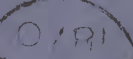
FOREST TREES.	In	Leaf Buds	In Leaf	Divested of	CROPS,	Sowing or	Appearing	In Ear	First C
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	Flower.	First appear.	Leaves.	mentioning variety.	Planting.	above Ground.	or Flower.	or Raised.
Alder,				Barley,				
Ash,				Bere or Bigg, .				
Beech,				Oats,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

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

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

3
Macman
January 1870

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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Breemar, County of Aberdeen, in Lat. 57° N., Long. 2° 24' W. Distance from Sea 60 miles.Height of Cistern of the Barometer above Mean Sea-level 1114 feet, above Ground 7 feet.During the MONTH of February, 1870.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Attention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.					
		9 h. A.M.		9 h. P.M.		Protected in Shade 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.											
		Barometer.	Attach- ed Ther- mometer	Barometer.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. No.	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	No.	Velocity (0-10), and Direction.	Amount, (0-10), and Species.	Velocity (0-10), and Direction.	Amount, (0-10), and Species.	No. 1 inches.					No. 2 inches.	No. 3 inches.	Temperature of Well, at depth of feet, No.	Temperature of air, at height of feet, and Density.	9 A.M. 9 P.M.
		* No.		No.		No.	No.	No.	No.																								
		inches.	°	inches.	°																												
	1	28.504		28.278		40.7	38.8	43.2	38.8	35.2	35.8	36.2	35.8	SW	0	SW	0	0.30	9	9									9.9	1			
	2	28.276		28.510		42.2	36.0	45.9	34.2	39.2	39.0	40.8	39.8	SW	0	SW	0	0.03	9	9									9.9	2			
	3	28.346		28.454		42.4	31.3	44.8	29.5	32.0	35.8	37.0	34.0	SW	0	SW	0	0.04	9	9									9.9	3			
	4	28.400		28.528		41.0	35.8	44.8	33.2	38.3	37.3	39.5	38.0	SW	0	SW	0	0.23	9	9									9.9	4			
	5	28.408		28.582		40.8	35.8	49.5	32.6	38.3	37.7	37.8	36.0	SW	0	SW	0	0.03	9	9									9.9	5			
	6	28.500		28.250		40.2	34.2	41.0	30.4	37.2	34.0	38.0	34.0	SW	0	SW	0.5	2.40	9	9									9.9	6			
	7	28.464		28.500		43.0	35.2	49.7	32.2	39.0	37.8	34.5	34.2	SW	0	SW	0.2	0.50	9	9									9.9	7			
	8	28.514		28.680		41.0	29.2	44.0	26.4	32.0	31.0	26.1	27.8	SW	0	SW	0	0.02	9	9									9.9	8			
	9	28.572		29.000		39.2	26.8	43.5	24.8	28.0	27.8	27.0	27.0	SW	0	SW	0	0	9	9									9.9	9			
	10	29.040		29.116		36.0	15.0	44.8	14.0	15.8	15.6	32.0	31.3	SW	0	SW	0	0	9	9									9.9	10			
	11	29.172		29.264		34.0	21.8	44.8	19.3	32.7	32.0	24.5	24.0	SW	0.5	SW	0	0	9	9									9.9	11			
	12	29.352		29.254		33.0	28.0	57.0	25.9	31.3	31.0	29.5	29.3	SW	0	SW	0	0.02	9	9									9.9	12			
	13	29.340		29.514		35.0	22.2	48.3	20.3	23.8	23.8	24.8	24.8	SW	0	SW	0.5	0.03	9	9									9.9	13			
	14	29.326		29.362		30.3	23.2	46.7	18.7	26.0	26.0	24.3	24.0	SW	0.5	SW	0.5	0	9	9									9.9	14			
	15	29.300		29.242		36.8	21.3	48.0	20.2	24.7	24.7	34.3	34.3	SW	0	SW	0	0	9	9									9.9	15			
	16	29.134		29.116		36.2	33.2	48.8	32.3	34.5	33.2	34.0	33.2	SW	0.2	SW	0.2	0	9	9									9.9	16			
	17	29.100		29.016		35.0	28.1	53.2	27.3	30.0	28.8	24.8	24.0	SW	0	SW	0	0	9	9									9.9	17			
	18	28.872		28.876		35.3	19.2	54.8	17.8	32.6	32.0	35.8	35.0	SW	0.5	SW	0.5	0	9	9									9.9	18			
	19	28.836		28.850		37.3	24.0	72.0	23.7	28.4	28.0	24.5	24.0	SW	0	SW	0	0	9	9									9.9	19			
	20	28.684		28.614		42.8	22.8	55.8	22.0	34.8	33.2	29.8	29.0	SW	0.5	SW	0.5	0	9	9									9.9	20			
	21	28.430		28.426		40.2	21.2	44.8	21.2	24.0	24.0	22.0	22.0	SW	0.5	SW	0.5	0.05	9	9									9.9	21			
	22	28.550		28.406		38.7	21.3	55.8	21.3	26.0	26.0	28.5	28.0	SW	0.2	SW	0.2	0	9	9									9.9	22			
	23	28.206		28.224		33.0	15.0	54.5	13.0	28.8	28.0	13.0	13.0	SW	0.2	SW	0	0.03	9	9									9.9	23			
	24	28.050		28.214		31.8	10.0	74.0	9.0	21.0	21.0	22.2	22.0	SW	0	SW	0	0	9	9									9.9	24			
	25	28.200		28.100		30.0	20.7	48.0	20.0	23.4	23.0	25.8	25.8	SW	0	SW	0	0	9	9									9.9	25			
	26	28.132		28.214		29.9	17.0	53.0	14.2	20.0	20.0	17.0	17.0	SW	0	SW	0	0.07	9	9									9.9	26			
	27	28.290		28.150		33.0	18.7	40.2	18.7	22.3	22.0	31.0	31.0	SW	0	SW	0	0.15	9	9									9.9	27			
	28	27.924		28.100		42.3	31.4	75.0	30.2	41.0	40.0	39.0	38.0	SW	1	SW	1.5	0.80	9	9									9.9	28			
	29																													29			
	30																													30			
	31																													31			
Sums.		11 10 2		99 8		9 97 128		15 9	1210	138	126	1710	165	2	3			2 4	209	206													
Means.		18 25 2		18 22 8		103 80 118 7		144 35	6710	84 56 82 71	85 33 83 67	84	116					15 4 40										9.0					
† Total Corrections for Instrumental Errors.		-0.09		-0.09																													
* Corrections for Diurnal Range.		28.643		28.642																													
"Corrected Means."																																	
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 28.638
for Temp. (Col. 2), = 28.643 - 0.005"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 28.637
for Temp. (Col. 4), = 28.642 - 0.005

Mean at Station, corrected, and at 32°, = 28.638

Correction for height, feet above Mean Sea-level, = 1.207

Mean, reduced to 32°, and Sea-level, = 29.83940

Highest Reading, corrected for Index error, on the 13th, = 29.340

Lowest Do. Do., on the 28th, = 27.928

Difference, or Monthly Range, = 1.4116

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 7th, = 43.0

Lowest in Month, corrected for Index errors, on the 24th, = 10.0

Difference, or Monthly Range, = 33.0

"Corrected Mean" of all the Highest, (Col. 5), = 37.1

"Corrected Mean" of all the Lowest, (Col. 6), = 25.85

Difference, or Mean Daily Range, = 11.85

** Calculated Mean Temperature of Month, = 31.43

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 28th, = 75.0

"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 51.56

Lowest at Night, Black Bulb, (corrected for Index errors), on the 24th, = 9.0

"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 24.0

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

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

Bulb, (Cols. 9 and 11), = 30.84

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 29.86

†† Computed Temperature of Dew-Point, = 27.3

†† Do. Elastic Force of Vapour, = .148

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

†† Relative Humidity, (Saturation = 100), = 74.87

RAIN fell on 15 Days; Amount in Inches, = 4.40

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Chm or Variable.	Mean Force.
A.M.		1	8	4	3	3	7	0	3	0	0.30
P.M.		1	7	6	0	3	8	1	2	0	0.41
Mean.		1	8	5	3	3	8	0	2	0	0.36 = 0.134

Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S." and a number to be entered in the Readings; or the number and initials of the maker may be here given.
†† Enabling corrections for both capillarity and Index Errors.
† The Diurnal Range for Scotland is as yet unknown.
†† Practically, though not absolutely a minus correction.
† These "Hygrometric Deductions" are calculated from Glaisher's Hygro-metric Tables, Second Edition only.
While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 7 and 8 will be entered as the "Calculated Mean Temperature."
Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

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

Observations made and
Return verified by

(Signed)

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

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

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

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be secured so as to form a tight plug to the cistern. Then *score 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 *level*, which may be impeded by putting a piece of white paper *behind* the tube. It must be perfectly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire.

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

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

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

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

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

Protection 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 an attached scale, micrometer repairs, they are very liable to be moved from their position on the scale, and ought never afterwards to be used, without being *reset*. The self-registering, and especially the *"Maximum"* Thermometers ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

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

One form of the Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in an *ice-box*, which also supports the water-cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the ice-box, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°·9, 40°·0, or 40°·1; or again, 40°·4, 40°·5, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°; or 40½, respectively. So also 41½, and 40½, more or less must be registered 40°·2 or 40°·3, and 40°·7 or 40°·8 respectively. In reading Rutherford's *"Min."* and *"Max."* Thermometers, the indication of heat and 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 who observes.

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

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

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

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

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

(*Notes.*)—Convenient abbreviations for Luise 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 (&c., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the *"Remarks."* The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on.

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

and Direction, "2, W." (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S. W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second *"Cloud"* column, an entry of $\frac{2}{4}$, st. (*cf.*) will indicate that the higher regions are covered to the "amount" of 4-fifths with *stratus* clouds; and that the sky is further obscured to the extent of 2-fifths 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 5, 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 general natural 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 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.

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

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

Remarks.—The *"Remarks"* column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given 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 differences ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed *"Remarks."* It is intended that observations by the Electrometer should be entered in this manner or on the side-marginal. 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 agriculturists. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. (Observation ought to be confined to individual trees and shrubs; to particular species of birds, and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term day* observations be taken;—viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B.

Edinburgh, 10th November 1870.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

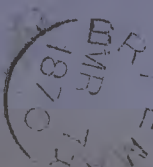
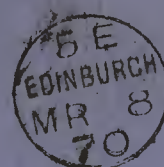
FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Out or Raised.
Alder,					Barley,				
Ash,					Bere or Bigg,				
Beech,					Oats,				
Birch,					Wheat,				
Elm,					Beans,				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

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

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

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

MR ALEXANDER BUCHAN,



Received
Feb 1870

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Braemar, County of Madison, in Lat. 57° 10', Long. 5° 14', Distance from Sea 60 miles.Height of Cistern of the Barometer above Mean Sea-level 114 feet, above Ground 3 feet.During the MONTH of March 1877.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS. Read Daily, at 5 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Prevalent or Elevation of Barometer, Drift, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.						
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.												
		Barometer. * No.	Atmospheric Thermometer	Barometer. No.	Atmospheric Thermometer	Max. No.	Min. No.	Max. in Sun-rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H. Cup Anemometer. No.	No. of hours in which it fell.	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.	Amount (0-10), and Species.					No. 1 inches.	No. 2 inches.	No. 3 inches.	Temperature at 1 foot, and Density.	0-10.	
		inches.		inches.																														
	1	27.100		28.150		45.0	34.3	40.0	34.2	40.0	34.2	38.0	36.8	SW	4	SW	1.5															1		
	2	28.568		28.552		46.8	31.2	38.0	29.0	38.0	32.4	34.5	33.2	SW	0.5	SW	0.5															2		
	3	28.724		28.542		39.9	29.3	37.9	29.0	38.0	32.2	32.0	32.0	E	0.2	E	0.2															3		
	4	29.020		29.100		38.6	28.2	39.3	27.0	31.0	30.0	31.0	30.0	SW	0	SW	0															4		
	5	29.222		29.322		41.7	23.4	37.3	23.0	25.5	25.0	27.2	27.0	SW	0	SW	0															5		
	6	29.316		29.314		37.0	22.8	40.3	22.0	30.3	29.2	38.0	37.2	SW	0	SW	0																6	
	7	29.772		29.240		41.3	31.4	53.0	29.0	40.5	39.0	40.3	38.4	SW	0.5	SW	0.5															7		
	8	29.282		29.166		44.0	35.0	61.4	33.3	58.2	36.8	58.0	57.0	SW	1	SW	1																8	
	9	29.068		29.054		43.2	35.0	82.0	32.8	39.5	38.3	58.4	57.2	SW	0	SW	1			0.07													9	
	10	28.900		28.850		48.0	37.9	67.3	36.4	40.1	39.0	41.0	38.3	SW	0.5	SW	0.5			0.02													10	
	11	28.868		28.850		48.7	24.7	53.3	24.3	30.8	30.0	24.7	24.0	SW	0.5	SW	1.5			0.01													11	
	12	28.412		28.470		45.8	18.0	76.8	13.0	21.8	20.8	27.5	27.0	SW	2	SW	2																12	
	13	28.578		28.600		45.3	24.0	87.0	20.3	28.8	28.0	26.6	26.0	SW	0.5	SW	0.2																13	
	14	28.700		28.610		46.5	20.0	88.0	15.8	26.8	26.3	24.3	23.0	SW	0	SW	0.5																14	
	15	28.880		28.850		40.4	31.8	57.3	27.4	35.0	33.8	38.0	38.0	SW	0.5	SW	0.5			0.03													15	
	16	28.216		28.366		41.0	34.4	50.0	29.9	37.8	37.7	38.2	38.0	SW	0	SW	0			0.05													16	
	17	28.472		28.672		50.8	36.3	45.3	35.2	40.0	38.8	41.0	40.5	SW	0	SW	0			0.02													17	
	18	28.986		29.082		48.8	32.0	60.3	28.0	39.0	38.5	41.9	40.8	SW	0	SW	0																18	
	19	29.142		29.112		53.3	38.5	107.0	34.6	44.4	43.0	45.8	43.8	SW	0	SW	0.5																19	
	20	29.040		29.084		49.3	38.2	74.8	34.7	44.6	43.0	48.4	46.7	SW	1	SW	0.5																20	
	21	28.950		28.650		46.3	36.0	73.8	31.8	40.3	38.8	44.8	42.8	SW	0	SW	0.5																21	
	22	28.638		28.800		46.2	24.3	64.3	22.4	26.3	25.3	24.3	24.0	SW	2	SW	2			0.02													22	
	23	28.784		28.856		45.4	28.2	56.8	21.3	26.3	26.3	30.0	30.0	SW	2	SW	1.5			0.02													23	
	24	28.786		28.744		40.3	28.3	87.3	25.3	32.0	31.0	32.7	32.0	SW	0.5	SW	0.5			0.03													24	
	25	28.754		28.850		38.0	29.4	69.4	24.8	32.6	31.3	30.0	30.0	SW	0.5	SW	0.5			0.01													25	
	26	28.980		28.862		35.8	29.0	59.2	26.0	31.3	31.0	29.8	29.0	SW	0.5	SW	0.2			0.01													26	
	27	29.100		29.134		39.3	28.2	88.0	21.8	31.8	31.0	35.6	35.0	SW	0	SW	0																27	
	28	29.200		29.232		49.3	34.3	78.0	26.8	39.8	37.3	45.3	44.3	SW	1	SW	1																28	
	29	29.210		29.176		51.4	26.0	99.8	23.4	35.1	34.3	45.0	41.8	SW	0	SW	0.2			0.16													29	
	30	29.050		29.058		48.2	39.8	60.0	33.8	44.2	42.8	40.3	40.2	SW	0	SW	0																30	
	31	29.006		29.004		53.0	38.7	82.2	37.3	40.2	40.2	42.8	41.0	SW	0	SW	0																31	
Sums.		1413.9		1247.7		174.169		148.151		111.189		141.132		4		12		196		200														
Means.		28.840		28.859		45.0302		38.8275		34.8337		36.3347		0.6				63		65														
Total Corrections for Instrumental Errors.		-0.02		-0.09						-1		-1																						
Total Corrections for Diurnal Range.																																		
Corrected Means.		28.831		28.850																														
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 for Temp. (Col. 2), = 28.814
"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = 28.831
Mean at Station, corrected, and at 32°, = 28.822
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 30.024
Highest Reading, corrected for Index error, on the 6 th., = 29.336
Lowest Do. Do., on the 1 th., = 27.900
Difference, or Monthly Range, = 1.436

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 17 th., = 53.3
Lowest in Month, corrected for Index errors, on the 12 th., = 13.0
Difference, or Monthly Range, = 40.3
"Corrected Mean" of all the Highest, (Col. 5), = 45.0
"Corrected Mean" of all the Lowest, (Col. 6), = 30.2
Difference, or Mean Daily Range, = 14.8
Calculated Mean Temperature of Month, = 37.6
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 19 th., = 101.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 73.8
Lowest at Night, Black Bulb, (corrected for Index errors), on the 12 th., = 13.0
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 27.5
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 356
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 341
Computed Temperature of Dew-Point, = 31.8
Do. Elastic Force of Vapour, = 187
Do. Weight of Vapour in a Cubic Foot of Air, =
Relative Humidity, (Saturation = 100), = 86
RAIN fell on 12 Days; Amount in Inches, = 0.37

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	4	6	1	1	0	15	1	3		0.68	
P.M.	1	7	1	1	3	10	3	5		0.67	
Mean.	2	6	1	1	2	13	2	4	0	0.68	0.46

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

Observations made and
Return verified by

(Signed)

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

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

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

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

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-inches* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their evidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *balance* on this little piston-rod is brought, by the adjusting screw, *so 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 *zero-point* 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 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 *slump lap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

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

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

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

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

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

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

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

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

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

Hour of observing Temperature.—The Hygrometer is read at 9 a.m. and 9 p.m. The self-registering Thermometers are read at 9 p.m. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological *day*. In the Society's schedules, the indications registered on the 8d are those of a series of phenomena commencing at 9 p.m. on the 2d, and extending till 9 p.m. on the 8d.

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

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

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

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly from unfavorable situation for observation, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauges; 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 in every column, the observer cannot be too careful to register *observations only*, and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's

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

Observations of the clouds are made at 9 a.m. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "*Velocity and Direction*," 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, ²/₁₀, (*e.g.*) will indicate that the higher regions are covered to the "*amount*" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting at ways 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 noted. **Ozone.**—Mention whether Schönbein's or Moffit'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 3xx, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0–6 is "4"; i.e., that it is *blowing fresh*.

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

Remarks.—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no table 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 agriculturists. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

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

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

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

EDINBURGH

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

MR ALEXANDER BUCHAN,



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20 APR 1870

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Princes*County of *Aberdeen*in Lat. *57° 36'*, Long. *5° 24' W.*, Distance from Sea *60* miles.Height of Cistern of the Barometer above Mean Sea-level *1114* feet, above Ground *0* feet.During the MONTH of *April* 1870.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.		Days of Month.				
		9 h. A.M.		9 h. P.M.		Protected in Shade.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		No. 3 inches.						No. 12 inches.	No. 22 inches.		
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-10).	Amount (0-10).	Velocity (0-10).	Amount (0-10).										
		inches.	°	inches.	°																										
	1	28.906		28.880		51.8	36.2	101.0	55.0	42.3	38.8	44.8	45.5	SW	0.2	SW	0.2									9.9	Law & fine	1			
	2	29.024		29.164		47.5	33.2	100.5	27.8	41.0	37.8	40.3	38.4	SW	0.2	SW	0.5									9.9	Do do	2			
	3	29.224		29.250		50.0	29.2	102.0	25.3	38.0	36.0	40.0	38.0	SW	0	SW	0									7.5	Do do	3			
	4	29.214		29.154		52.8	27.7	105.0	23.2	42.8	39.3	38.0	37.3	SW	0	SW	0.2									9.9	Do do	4			
	5	28.990		28.750		51.0	30.2	67.0	25.3	44.3	40.3	43.6	39.8	SW	0	SW	0.5	0.03								9.9	Do but cloudy (falling snow)	5			
	6	28.842		28.668		51.0	34.3	101.0	32.0	41.1	39.9	43.8	41.0	SW	0	SW	0									9.9	Do but dull	6			
	7	28.662		28.580		47.2	33.2	87.8	30.0	38.0	35.3	39.8	37.0	SW	0.5	S	1	0.22								9.9	Do do	7			
	8	28.250		28.182		47.0	30.8	92.0	30.0	40.0	38.0	38.0	35.7	S	0.5	SW	1	0.02								9.9	Shower of snow	8			
	9	28.214		28.222		46.4	30.0	87.7	24.6	38.2	35.0	38.0	37.0	SW	0	SW	0.5	0.01								9.9	Law & Sunshine	9			
	10	28.540		28.564		45.8	36.2	97.5	31.3	39.8	36.7	43.1	44.3	SW	0.5	SW	0.5									9.9	Slight shower of snow	10			
	11	28.714		28.776		50.3	38.0	94.7	34.2	45.0	41.2	42.8	40.2	SW	0.5	SW	1.5	0.02								9.9	Do do. Rain bow	11			
	12	28.664		28.676		51.0	41.2	82.0	39.8	45.6	43.3	46.0	43.4	S	1	SW	0.5									9.9	Law & cloudy all day	12			
	13	28.790		28.788		51.8	40.8	100.3	38.0	46.3	42.7	43.0	40.3	SW	1	SW	1.5	0.13								9.9	Do fine with sun at 5 P.M.	13			
	14	28.970		29.030		50.0	38.2	104.2	33.8	39.2	38.5	45.5	42.8	SW	1	SW	0.5									9.9	Occasional shower cloudy	14			
	15	29.096		29.182		57.7	42.9	88.0	38.8	46.9	43.0	47.0	41.2	W	1.5	SW	1.5									9.9	Law & Sunshine	15			
	16	29.284		29.232		62.3	42.0	110.0	34.2	52.2	48.3	47.0	45.0	W	0	SW	0.5									9.9	Cloudy & dry	16			
	17	29.170		29.120		65.8	33.0	112.3	29.0	53.8	49.9	48.0	45.8	W	0	SW	1									9.9	Do do	17			
	18	29.036		28.964		66.0	33.0	110.0	29.0	50.2	49.3	47.4	44.8	S	0	S	0.2									9.9	Do do	18			
	19	28.884		28.876		61.8	37.0	109.8	31.7	54.0	47.8	49.0	44.8	SW	0	S	0									9.9	Do do	19			
	20	28.774		28.670		67.8	34.2	107.7	30.3	55.7	51.0	55.0	52.0	W	0	S	0	0.33								9.9	Law & cloudy till 5 P.M.	20			
	21	28.866		28.750		59.8	41.3	100.0	35.0	47.3	43.0	45.6	42.2	SW	1	SW	2	0.19								9.9	Law & occasional Sunshine	21			
	22	28.636		28.550		53.2	38.7	94.8	34.6	45.5	42.8	42.7	38.3	S	1.5	S	2	0.26								9.9	Shower all day	22			
	23	28.824		28.850		52.3	37.0	100.3	33.0	43.2	40.0	41.3	39.3	SW	2	SW	1.5									9.9	Slight shower & cloudy	23			
	24	28.766		28.872		53.7	39.3	78.8	37.0	49.9	47.7	47.6	45.0	SW	1.5	SW	1	0.51								9.9	Law but dull	24			
	25	28.904		28.780		59.1	46.7	104.0	45.3	52.0	49.5	49.0	47.0	SW	1.5	SW	2									9.9	Do occasional Sunshine	25			
	26	28.650		28.700		53.7	37.8	96.0	33.2	45.3	42.0	45.7	36.3	W	2	SW	1.5	0.13								9.9	Snow on hills shower of hail	26			
	27	28.822		28.950		48.2	29.9	82.0	29.9	55.0	53.8	53.0	52.2	W	4	W	2	0.05								9.9	Very stormy with Law & high wind all day	27			
	28	28.924		28.880		44.7	31.7	68.8	30.3	55.6	53.0	57.8	55.2	SW	1	SW	1	0.14								9.9	Slight shower & Law	28			
	29	28.600		28.616		53.0	34.8	60.8	32.0	42.8	41.8	47.0	45.0	W	0.5	SW	1.5	0.05								9.9	Shower & clouds all day	29			
	30	28.240		28.012		50.2	36.0	102.0	33.0	46.2	45.3	37.8	37.0	SW	1	SW	1.5	0.44								9.9	Snow on hills	30			
	31																														
Sums.		714.9		1615.6		12.12	141.0	12.9	148	1510	16.11	179	158	4		22.9	27.4	2.03	161	173											
Means.		28.810		28.791		53.4	35.8	95.0	32.2	44.7	41.6	43.4	41.2	0.76		0.92		5.4	5.8							9.2					
+ Total Corrections for Instrumental Errors.		-0.09		-0.00															5.6								7.0				
+ Corrections for Diurnal Range.																															
"Corrected Means."		28.801		28.782						41.5	41.1																				
No. of Columns.		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 for Temp. (Col. 2), = *28.759*
for Temp. (Col. 2), = *28.801*..... - *0.042*..}

"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = *28.744*
for Temp. (Col. 4), = *28.782*..... - *0.038*..}

Mean at Station, corrected, and at 32°, = *28.752*

Correction for height, feet above Mean Sea-level, = *1.202*

Mean, reduced to 32°, and Sea-level, = *29.954*

Highest Reading, corrected for Index error, on the 16 th, = *29.254*

Lowest Do. Do., on the 20 th, = *28.012*

Difference, or Monthly Range, = *1.242*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 20 th, = *67.8*

Lowest in Month, corrected for Index errors, on the 4 th, = *27.7*

Difference, or Monthly Range, = *40.1*

"Corrected Mean" of all the Highest, (Col. 5), = *53.4*

"Corrected Mean" of all the Lowest, (Col. 6), = *35.8*

Difference, or Mean Daily Range, = *17.6*

** Calculated Mean Temperature of Month, = *44.6*

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 17 th, = *112.3*

"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *95.0*

Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = *23.2*

"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = *32.2*

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = *44.0*

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = *41.3*

Computed Temperature of Dew-Point, = *38.1*

Do. Elastic Force of Vapour, = *23.0*

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

Relative Humidity, (Saturation = 100), = *79*

RAIN fell on 15 Days; Amount in Inches, = *2.03*

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day.
	Direction.	N	NE	E	SE	S	SW	W	NW	Variable.		
A.M.		1	0	0	0	5	15	7	2		0.76	
P.M.		0	1	0	0	5	21	1	2		0.92	
Mean.		1	0	0	0	5	18	4	2	0	0.84	= 0.714

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

Observations made and
Returns 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 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 (nominally or even- ing) 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, it not at 9 o'clock.

Barometer.—*Weather glasses* and *Anemols*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. No-ean 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. Aldie 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; the stem passes freely through the lid and case of the cistern. When the *index-disk* 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 *remarks*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be removed so as to form a tight plug to the cistern. Then *screw* up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern upmost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *slight 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 curves, quickly of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

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

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

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

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

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

One form of the 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, under an exact coincidence with, or a little over 40°, or 40½, respectively. So also 40½, and 40½, more or less must be registered 40°.2 or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's *"Max"* and *"Min"* Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity 9, 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, or 4, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

Sunshine.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column. *Underground Thermometers.*—As the penetration and heating 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 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, 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 Schœnbein's or Modifi'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 3½, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N. W., and that its force on the scale 0—6 is "4", *i.e.*, that it is *blowing fresh*.

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

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

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

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner 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, and 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 *year day* observations be taken;—*viz.*, on the 21st days of March, June, September, and December.

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

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

(By Order) A. B.

EDINBURGH, 16th November 1870.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

EDINBURGH.

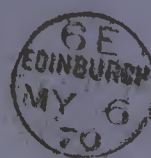
General Post Office Buildings,

Secretary of the Meteorological Society of Scotland,

MR ALEXANDER BUCHAN,



70



Buchanan
April 1870

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Braemar, County of Aberdeen, in Lat. 57° N., Long. 5° 24' W., Distance from Sea 60 miles.
Height of Cistern of the Barometer above Mean Sea-level 1116 feet, above Ground 5 feet. During the MONTH of May 1870.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. —				WIND.				RAIN.		CLOUDS.				SUNSHINE. Hours.	THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.									
		Barometer.	Atmospheric Thermometer.	Barometer.	Atmospheric Thermometer.	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 Direction.	Velocity (0—10), and Direction.	Amount (0—10), and Direction.		No. 1	No. 2	No. 3				
		* No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.		No.	No.	No.				
	1	28.200	28.972	45.805	60.832	59.038	54.253	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.45	10	10	10	10	9	9	9	9	9	9	Shower, Sun, rain.	1	
	2	28.700	28.760	42.832	70.830	56.753	53.832	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.04	10	10	10	10	9	9	9	9	9	9	Very stormy with snow & hail.	2	
	3	28.860	28.900	44.432	50.829	55.353	52.836	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.01	10	10	10	10	9	9	9	9	9	9	Shower of snow	3	
	4	28.984	29.008	48.235	48.229	48.841	42.440	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	Do	4	
	5	29.090	29.120	52.341	100.035	47.048	46.040	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	Fair & Sunshine	5	
	6	29.116	29.130	56.644	109.037	49.046	46.848	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	Do	6	
	7	29.130	29.130	59.831	107.027	47.342	47.845	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Sunny & Rainy Thunder 11 P.M.	7
	8	29.150	29.160	58.839	115.550	50.046	49.046	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Fair & Sunshine	8
	9	29.070	28.916	61.032	110.134	51.846	51.347	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	9
	10	28.870	28.676	55.842	70.236	49.846	48.041	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	10
	11	28.412	28.160	51.036	29.032	41.239	39.037	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.20	10	10	10	10	9	9	9	9	9	9	9	Fair but dull	11
	12	27.450	27.870	51.538	95.836	46.044	45.043	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.49	10	10	10	10	9	9	9	9	9	9	9	Rain & showers of hail	12
	13	28.094	28.142	51.841	93.837	46.844	45.842	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.13	10	10	10	10	9	9	9	9	9	9	9	Shower & Thunder	13
	14	28.212	28.400	52.841	105.735	47.844	47.044	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.03	10	10	10	10	9	9	9	9	9	9	9	Fair & occasional Sunshine	14
	15	28.486	28.480	53.844	104.238	48.244	47.243	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.05	10	10	10	10	9	9	9	9	9	9	9	Do	15
	16	28.532	28.584	58.041	111.037	47.644	46.543	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.05	10	10	10	10	9	9	9	9	9	9	9	Clear but showery & Thunder	16
	17	28.664	28.682	58.839	89.235	46.844	45.842	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.06	10	10	10	10	9	9	9	9	9	9	9	Partly & Showery	17
	18	28.744	28.850	58.046	104.041	55.850	48.044	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Fair & dry	18
	19	28.682	28.520	59.445	98.140	52.749	56.253	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	19
	20	28.644	28.724	59.048	74.841	48.846	47.044	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	dull	20
	21	28.862	28.702	54.043	94.043	51.646	48.848	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.38	10	10	10	10	9	9	9	9	9	9	9	Do	21
	22	28.742	28.956	51.843	61.240	47.245	44.042	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.02	10	10	10	10	9	9	9	9	9	9	9	Dark & Showery	22
	23	28.986	29.000	52.835	69.829	45.544	51.048	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	23
	24	28.886	29.046	57.845	117.058	55.852	44.842	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Fair & occasional Sunshine	24
	25	29.202	29.274	58.643	109.058	48.044	52.047	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	25
	26	29.184	29.226	63.847	118.242	56.852	53.857	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	26
	27	29.164	29.128	73.448	120.046	56.854	55.654	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	27
	28	29.060	28.986	66.048	116.840	53.451	48.247	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Do	28
	29	28.900	28.824	65.244	113.838	58.054	55.053	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	—	10	10	10	10	9	9	9	9	9	9	9	Cloudy	29
	30	28.684	28.446	57.847	70.240	53.852	54.052	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.13	10	10	10	10	9	9	9	9	9	9	9	Do & Showery	30
	31	28.262	28.288	55.246	74.046	47.847	51.050	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	54.1	54.3	0.56	10	10	10	10	9	9	9	9	9	9	9	Do	31
	Sums.	13147	14129	15413	1439	141	1814	1414	181	1210	159	1210	159	159	231	159	231	2.66	204	198											
	Means.	28.753	28.761	55.741	94.537	48.445	47.144	0.57	0.74										6.6	6.4											
	† Total Corrections for Instrumental Errors.	-0.05	-0.09																												
	† Corrections for Diurnal Range.																														
	“Corrected Means.”	28.741	28.752																												
	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†† for Temp. (Col. 2), = 28.693
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 28.704
Mean at Station, corrected, and at 32°, = 28.698
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 29.900
Highest Reading, corrected for Index error, on the 25th, = 29.274
Lowest Do. Do. on the 12th, = 27.870
Difference, or Monthly Range, = 1.404

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 27th, = 73.4
Lowest in Month, corrected for Index errors, on the 7th, = 31.7
Difference, or Monthly Range, = 41.7
“Corrected Mean” of all the Highest, (Col. 5), = 53.7
“Corrected Mean” of all the Lowest, (Col. 6), = 41.0
Difference, or Mean Daily Range, = 14.7
** Calculated Mean Temperature of Month, = 48.4
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 27th, = 120.0
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 94.5
Lowest at Night, Black Bulb, (corrected for Index errors), on the 7th, = 27.5
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 37.3
Difference of above Means or Range (“exposed”), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 47.8
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 45.2
†† Computed Temperature of Dew-Point, = 42.3
†† Do. Elastic Force of Vapour, = 270
†† Do. Weight of Vapour in a Cubic Foot of Air, = 8.3
†† Relative Humidity, (Saturation = 100), = 83
RAIN fell on 14 Days; Amount in Inches, = 2.66

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	1	0	2	6	11	6	4		0.57	
P.M.	0	3	3	2	5	12	0	6		0.74	
Mean.	0	2	2	2	5	12	3	5	0	0.62	0.38

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

Observations made and
Return verified by

(Signed)

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

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

An excellent Barometer is constructed by Mr. A. L. 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 end 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 *practically* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *weather*.

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 unperforated. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *slight tap* is produced. If this is prevented by air it may be removed to the cistern, and 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 weather, which must be exactly adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, *Self-registering Thermometers*.—Professor Phillips, and Negeyiti and Zambra; 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-mitted by striking the instrument repeatedly against the palm of the hand: if wind part of the spirit distils by high temperature, it will be found near the top of the tube, and may be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "*Maximum*" should be freely exposed to the sun, and the "*Minimum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; for the sun's heat to affect the Minimum Thermometer by distillation.

Exposition 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, undepo 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 variations from the approved and *well-tested* form of this apparatus seriously vitiate the "*Hygrometrical Deductions*," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the manila 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 manila 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 "*Nelson'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°.4, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40½°, and 40¾°, more or less must be registered. 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 observations to their proper meteorological day. In the Society's schedule, the indications registered on the 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Wind.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the main 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, &c.

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "*Velocity* 6, S. W. 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, (*4* q) will indicate that the higher regions are covered to the "*amount*" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

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

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. **Ozone.**—Mention whether Schönbien's or Meffert'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^{xx}, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "*3*" on the scale, that the wind is from the N.W., and that its force on the scale 0-6 is "*4*" i.e., that it is *blowing fresh*.

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

Remarks.—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognized and in use at Greenwich, and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been 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 purposes, from that headed "*Remarks*." It is intended that observations by the Electrometer should be entered in this manner on the side-margin. Additional remarks may be made on the margin.

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

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

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

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

(By Order) A. B.

EDINBURGH, 17th November 1870.

BOOK-POST.

EDINBURGH.

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

MR ALEXANDER BUCHAN,

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OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Brummer, County of Argyll, in Lat. 57° 15', Long. 5° 26', Distance from Sea 60 miles.
Height of Cistern of the Barometer above Mean Sea-level 1114 feet, above Ground 5 feet. During the MONTH of June 1875.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				SUNSHINE. Hours.	THERMOMETERS under Ground.			SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.	
	9 h. A.M.		9 h. P.M.		Protected in Shade, 3 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.										
	Barometer. No.	Attached Thermometer	Barometer. No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass, No.	Dry bulb. No.	Wet bulb. No.	Dry bulb. No.	Wet bulb. No.	Direction. No.	Force. No.	Direction. No.	Force. No.	Velocity (0—6), and Direction. No.	Amount (0—10), and Species. No.	Velocity (0—6), and Direction. No.	Amount (0—10), and Species. No.	No. 1 inches.	No. 2 inches.		No. 3 inches.							
	inches.	°	inches.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°		°	°	°					°
1	28.446	28.702	59.8	47.0	111.0	46.5	58.8	48.5	53.2	57.0	11.1	1.2	SE	0.5			0.02	Cloud	Cloud							Thin	1				
2	28.874	28.644	65.8	43.8	107.8	38.2	55.8	57.6	48.4	47.0	11.8	0.8	SE	0.2			—	Cloud	Cloud							Do	2				
3	28.446	29.050	57.2	42.8	65.3	56.7	47.2	46.8	48.5	47.0	11.8	0.8	SW	0.8			0.09	Cloud	Cloud							Dull & misty all day	3				
4	29.140	29.322	65.3	48.2	103.2	47.0	56.2	54.0	58.8	57.4	11.8	0.8	SW	0.0			—	Cloud	Cloud							fine occasional sunshines	4				
5	29.444	29.460	72.8	49.0	122.8	44.0	62.8	58.8	62.3	60.3	11.8	0.8	SW	0.5			—	Cloud	Cloud							Do	5				
6	29.450	29.456	73.8	46.7	126.3	42.3	67.8	61.0	62.3	60.3	11.8	0.8	SW	0.5			—	Cloud	Cloud							Do	6				
7	29.418	29.328	70.6	56.2	111.3	57.2	62.2	60.2	59.3	57.3	11.8	0.8	E	0.5			—	Cloud	Cloud							Do	7				
8	29.050	28.760	67.8	46.4	120.0	46.2	64.8	58.4	59.0	47.0	11.8	0.8	W	1.5			—	Cloud	Cloud							Dark & cloudy	8				
9	28.612	28.582	55.0	42.3	107.8	37.8	47.8	45.4	48.0	42.0	11.8	0.8	W	0.0			0.20	Cloud	Cloud							Showery	9				
10	28.400	28.376	57.8	39.0	110.0	36.0	44.2	42.3	48.0	44.6	11.8	0.8	W	1.5			0.09	Cloud	Cloud							Do Snow on hills	10				
11	28.300	28.650	57.0	40.0	105.8	33.8	47.8	48.0	48.0	42.4	11.8	0.8	SW	0.0			0.16	Cloud	Cloud							Do Hail	11				
12	28.820	28.734	53.8	38.7	100.0	33.3	48.2	48.3	48.3	47.3	11.8	0.8	SW	1.5			0.11	Cloud	Cloud							Do Dull	12				
13	28.822	28.844	63.2	47.4	114.0	44.0	56.0	58.8	57.0	52.2	11.8	0.8	SW	0.5			0.03	Cloud	Cloud							Do occasional sunshines	13				
14	28.820	28.884	64.0	41.3	101.3	44.4	48.8	53.4	57.3	50.8	11.8	0.8	SW	0.5			—	Cloud	Cloud							Do	14				
15	28.890	28.850	72.0	39.2	118.1	38.1	53.3	50.2	51.8	50.2	11.8	0.8	SW	1.5			0.02	Cloud	Cloud							Do	15				
16	28.762	28.780	60.0	40.1	96.0	44.8	56.8	53.0	53.2	52.0	11.8	0.8	SW	0.5			—	Cloud	Cloud							Do	16				
17	28.736	28.700	66.5	45.3	127.0	43.0	54.0	51.3	52.8	51.0	11.8	0.8	SW	0.0			0.04	Cloud	Cloud							Slight Showers & Cloudy	17				
18	28.660	28.850	61.3	43.2	110.3	39.0	52.0	58.6	56.3	54.3	11.8	0.8	SW	1.5			0.02	Cloud	Cloud							Fine & sunshines	18				
19	28.350	28.780	62.7	48.7	105.3	41.4	54.3	52.8	56.1	54.2	11.8	0.8	SW	2.0			0.02	Cloud	Cloud							Showery & Cloudy	19				
20	28.826	29.022	60.2	49.8	111.0	45.3	54.6	52.3	53.2	51.2	11.8	0.8	SW	1.5			—	Cloud	Cloud							Fine & sunshines	20				
21	29.100	29.064	72.0	52.5	110.0	49.0	62.8	61.0	61.3	59.3	11.8	0.8	SW	0.0			—	Cloud	Cloud							Do	21				
22	29.070	29.080	66.1	49.6	103.8	44.0	57.8	56.3	49.3	47.8	11.8	0.8	SW	1.5			—	Cloud	Cloud							Do	22				
23	29.000	28.900	61.6	43.5	104.3	36.3	50.4	48.3	46.3	45.0	11.8	0.8	W	1.5			0.11	Cloud	Cloud							Slight Showers	23				
24	28.750	28.752	54.8	40.0	118.0	38.6	48.2	46.6	45.7	45.0	11.8	0.8	SW	0.5			0.04	Cloud	Cloud							Do	24				
25	28.854	28.842	57.2	43.4	111.0	39.0	48.4	46.6	48.4	48.2	11.8	0.8	SW	0.5			0.10	Cloud	Cloud							Do	25				
26	28.700	28.658	57.8	44.4	102.2	43.3	54.0	51.0	49.9	48.3	11.8	0.8	SW	0.5			0.10	Cloud	Cloud							Do	26				
27	28.800	28.924	58.5	46.2	113.8	45.3	47.8	46.9	49.7	47.8	11.8	0.8	SW	0.2			—	Cloud	Cloud							Do	27				
28	28.950	28.950	59.9	45.2	115.0	42.7	53.8	51.0	53.0	51.2	11.8	0.8	SW	1.5			0.02	Cloud	Cloud							Fine & sunshines	28				
29	28.722	28.914	62.8	46.0	119.0	45.8	56.0	53.3	52.2	50.0	11.8	0.8	SW	0.5			—	Cloud	Cloud							Do	29				
30	28.540	28.828	57.8	43.3	100.0	39.3	51.8	56.4	48.0	46.4	11.8	0.8	SW	1.5			0.11	Cloud	Cloud							Showery	30				
31																											Calm & vegetation looking remarkably well	31			
Sums.	1105	28.602	612.0	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0	1105	416.0					
Means.	28.853	28.899	61.6	40.2	108.2	41.5	54.1	57.3	51.9	50.3	0.22	0.70					7.1	6.4													
† Total Corrections for Instrumental Errors.	-0.09	-0.09																													
† Corrections for Diurnal Range.																															
“Corrected Means.”	28.844	28.890																													
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†† = 28.778
for Temp. (Col. 2), = 28.544. — 0.66. —
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 28.829
for Temp. (Col. 4), = 28.590. — 0.66. —
Mean at Station, corrected, and at 32°, = 28.804
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 30.006
Highest Reading, corrected for Index error, on the 6th, = 29.456
Lowest Do. Do. on the 11th, = 28.300
Difference, or Monthly Range, = 1.156

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6th, = 73.8
Lowest in Month, corrected for Index errors, on the 12th, = 38.7
Difference, or Monthly Range, = 35.1
“Corrected Mean” of all the Highest, (Col. 5), = 61.6
“Corrected Mean” of all the Lowest, (Col. 6), = 45.2
Difference, or Mean Daily Range, = 16.4
* Calculated Mean Temperature of Month, = 53.4
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 6th, = 128.3
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 108.2
Lowest at Night, Black Bulb, (corrected for Index errors), on the 12th, = 33.6
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 41.5
Difference of above Means or Range (“exposed”), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 53.0
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 50.7
†† Computed Temperature of Dew-Point, = 48.4
†† Do. Elastic Force of Vapour, = 34.0
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = 84
RAIN fell on 17 Days; Amount in Inches, = 1.28

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Chm. or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	2	2	0	4	15	3	3		0.22	
P.M.	1	3	1	2	4	10	3	7		0.70	
Mean.	1	2	2	1	4	12	3	5	0	0.46	

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

Observations made and
Return verified by

(Signed)

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

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

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (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 aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment or compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

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

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *screw up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern 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 lap* 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 inside, and fixed 4 feet above grass in an exposed position, free from nearby local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to *protect* the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the publishers *Self-registering Thermometers*.—Professor Phillips, and Negretti and Zambra's Patent *Maximum* Thermometers are recommended: printed directions for their use may be obtained with each instrument. The *Minimum* Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the *Maximum*. This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the *Hygrometrical Deductions*, Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of *Maximum* 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 requirement shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.9, 40.0, or 40.1; or again, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40½°, and 40¾°, more or less must be registered 40.2, 40.3, and 40.7 or 40.8 respectively. In reading Rutherford's *Maximum*, and *Minimum* 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, they sometimes occur at any hour; and the *index* of the lower strata of clouds overlaid, and to the direction of smoke, etc.

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

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

Observations of the clouds are made at 9 a.m. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity 6, S. W." (for example), will indicate that the upper strata of clouds travel with *extreme* velocity from S. W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of 2, cast, (egd) 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 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 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 Schomben'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 3½, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N. W., and that its force on the scale 0—6 is "4"; i.e., that it is *blowing fresh*.

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

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are 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 as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

The Council recommend that *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 makers.

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

(By Order) A. B.

Edinburgh, 20th November 1870.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

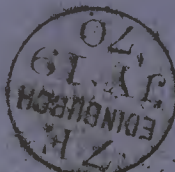
SIRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple,			Cuckoo,		
Bountree or Elder,		Black Currant,			Curlew,		
Broom,		Cherry,			House-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Plover,		
Holly,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

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

EDINBURGH.

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

MR ALEXANDER BUCHAN,



Brecon
June, 1870

SCOTTISH METEOROLOGICAL SOCIETY.

BAROMETER, "corrected Mean" at 9 A.M., <i>minus</i> the Correction $^{+1}$	=	28.726
for Temp. (Col. 2), = 28.806... - .079...		
"Corrected Mean" of Barometer at 9 P.M., <i>minus</i> the Correction $^{+1}$	=	28.747
for Temp. (Col. 4), = 28.822... - .075...		
Mean at Station, corrected, and at 32',	=	28.7386
Correction for height, feet above Mean Sea-level,	=	1.202
Mean, reduced to 32', and Sea-level,	=	29.940 ³⁸
Highest Reading, corrected for Index error, on the 28 th ,	=	29.186
Lowest Do. Do., on the 4 th ,	=	28.366
Difference, or Monthly Range,	=	0.820

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 29 th ,.....	=	80.8
Lowest in Month, corrected for Index errors, on the 3 rd th,	=	35.0
Difference, or Monthly Range,	=	45.8
"Corrected Mean " of all the Highest, (Col. 5),	=	67.5
"Corrected Mean " of all the Lowest, (Col. 6),	=	48.9
Difference, or Mean Daily Range,	=	18.6
¹⁰⁰ Calculated Mean Temperature of Month,	=	58.2
 S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 22 nd th,.....		
	=	128.3
"Corrected Mean, " (Col. 7), of Black Bulb, Max. in Sun,	=	108.1
Lowest at Night, Black-Bulb, (corrected for Index errors), on the 3 rd th, ...	=	31.0
"Corrected Mean, " (Col. 8), of Black Bulb, Min. on grass,	=	43.58
Difference of above Means or Range ("exposed"),	=	65.1

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb , (Cols. 9 and 11),	=	58.52
Mean (corrected) A.M. and P.M. Reading of Wet Bulb , (Cols. 10 and 12),	=	55.3
‡ Computed Temperature of Dew-Point ,	=	52.47
‡ Do. Elastic Force of Vapour ,	=	4.47 395
‡ Do. Weight of Vapour in a Cubic Foot of Air , ...	=	
‡ Relative Humidity , (Saturation = 100),	=	88.80
RAIN fell on <u>10</u> Days; Amount in Inches,	=	1.97

WIND.	SUMMARY.								Calcu or Variable.	Mean Force.	Mean Velocity in miles per day	
	Direction.	N	NE	E	SE	S	SW	W				NW
A.M.		1	4	4	1	4	14	1	2	0	0.02	
P.M.		0	9	1	1	4	15	0	1	0	0.81	
Mean.		1	8	2	1	4	14	1	2	0	0.36	0.04

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 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 3-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 *adjustments* or *compensations* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-inches* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float whose stem passes freely through the lid and case of the cistern. When the *aneroid* 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 *venturi*.

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 *screen* up the tube and take down the instrument; it may then be carried with 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 touching the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

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

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

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

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

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

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are not *exhibited* 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 "*Minimam*." Thermometers ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Meteorological may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "*Hygrometrical Deductions*," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be immersed 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 "*Alcock's*" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in tin case, which also supports the water-cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.9, 40.0, or 40.1; or again, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40° or 40½, respectively. So also 40½, and 40¾, more or less must be registered 40.2 or 40.4, and 40.7 or 40.8 respectively. In reading Rutherford's "*Max*," and "*Min*," Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, 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, 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 schedule, the indications registered at 9 P.M. on the 24, and extending till 9 P.M. on the 25.

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

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

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

Remarks.—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 inextinguishable position for the rain-gauge; and in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

Snowfall.—Many, 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 parakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Late Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less observation of the *sky overhead* (*ie.*, 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 "*Remarks*." column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered from a scale of 0 to 10; thus, when the *sky overhead* is *half covered* by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "*Velocity* 6, S. W. and Direction," 2, W. (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "*Cloud*" column, an entry of $\frac{4}{2}$ (*ie.*) 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 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 35, 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 Schindler's or Morf's papers are used. The paper is attached 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 9.1, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "9" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "*4*," *ie.*, 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 observatory 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 notices 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 differences 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, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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

EDINBURGH, 19th November 1870.

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

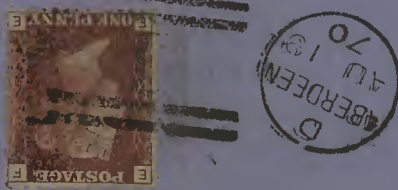
SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple,			Cuckoo,		
Bouree or Elder,		Black Currant,			Curlow,		
Broom,		Cherry,			House-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Plover,		
Holly,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

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

EDINBURGH.

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

MR ALEXANDER BUCHAN,



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Brechin, County of Aberdeen, in Lat. 57° 14', Long. 2° 24', Distance from Sea 60 miles.
Height of Cistern of the Barometer above Mean Sea-level 114 feet, above Ground 5 feet. During the MONTH of August 1870.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 A.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			STATION.	OZONE.	GENERAL REMARKS.		Days of Month.																																																																																																																																																																																		
		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.			9 h. P.M.																																																																																																																																																																																				
		Barometer. No.	Attached Thermometer. No.	Barometer. No.	Attached Thermometer. No.	No.	Reading.	No.	Reading.	No.	Reading.	No.	Reading.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches. No.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.			Amount (0-10), and Species.	No.		Reading.	No.	Reading.	No.	Reading.	No.	Reading.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. No.	Temperature at depth of feet. 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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 28.803
for Temp. (Col. 2), = 28.874 - 0.071
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 28.811
for Temp. (Col. 4), = 28.877 - 0.066
Mean at Station, corrected, and at 32°, = 28.807
Correction for height, feet above Mean Sea-level, = 1.262
Mean, reduced to 32°, and Sea-level, = 30.069
Highest Reading, corrected for Index error, on the 13 th, = 29.300
Lowest Do. Do., on the 28 th, = 28.474
Difference, or Monthly Range, = 0.826

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 9 th, = 76.0
Lowest in Month, corrected for Index errors, on the 26 th, = 40.0
Difference, or Monthly Range, = 36.0
"Corrected Mean" of all the Highest, (Col. 5), = 65.0
"Corrected Mean" of all the Lowest, (Col. 6), = 45.2
Difference, or Mean Daily Range, = 19.8
** Calculated Mean Temperature of Month, = 55.7
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 11 th, = 132.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 109.0
Lowest at Night, Black Bulb, (corrected for Index errors), on the 11 th, = 41.6
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 41.6
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 54.9
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 52.6
†† Computed Temperature of Dew-Point, = 50.4
†† Do. Elastic Force of Vapour, = 366
†† Do. Weight of Vapour in a Cubic Foot of Air, = 85
Relative Humidity, (Saturation = 100), = 85
RAIN fell on 12 Days; Amount in Inches, = 4.79

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Only or Variable.	Mean Force.
A.M.	2	7	2	2	6	6	2	4			0.15
P.M.	1	8	3	2	8	5	0	4			0.54
Mean.	2	7	2	2	7	6	1	4	0		0.34 = 0.12 u

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

Observations made and Return verified by

James A. Wilson

(Signed)

James A. Wilson

James A. Wilson

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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Braemar, County of Shroven, in Lat. 57° 14', Long. 2° 24' W. Distance from Sea 60 miles.Height of Cistern of the Barometer above Mean Sea-level 1114 feet, above Ground 5 feet.During the MONTH of September 1870.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.		THERMOMETERS under Ground.	SEA.	OZONE.	GENERAL REMARKS.		Days of Month.						
		9 h. A.M.	9 h. P.M.	Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	9 A.M.	P.M.														
				Max. No.	Min. No.	Max. in Sun rays No.	Min. on Grass. No.																								
																		Dry bulb.	Wet bulb.							Dry bulb.	Wet bulb.				
Barometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.		Thermometer.									
* No.		No.		No.		No.		No.		No.		No.		No.		No.		No.		No.		No.									
inches.		inches.		inches.		inches.		inches.		inches.		inches.		inches.		inches.		inches.		inches.		inches.									
1	28.557	28.300	57.0	43.2	91.0	43.5	45.7	45.7	53.0	55.0	St. 0	S. 1		0.80	10	10							1								
2	28.064	28.042	59.0	47.0	107.0	46.0	53.0	49.7	52.0	50.8	St. 0.5	S. 1.5		0.04	10	10							2								
3	28.200	28.450	59.2	45.0	89.8	44.7	49.3	47.3	45.0	44.3	St. 1.1	S. 1.5		0.02	10	10							3								
4	28.550	28.400	58.1	40.7	87.0	38.8	47.2	46.2	52.0	53.0	St. 1.5	St. 2.		0.45	10	10							4								
5	28.180	28.164	59.2	49.0	97.0	46.8	53.0	50.8	57.2	50.0	St. 2.	St. 2		0.21	10	10							5								
6	28.250	28.174	59.5	45.3	116.0	40.3	52.2	46.8	52.3	51.0	St. 0.5	St. 0		—	10	10							6								
7	28.074	28.164	50.8	42.7	71.8	37.0	49.9	48.2	47.8	47.3	St. 0.	St. 0.2		0.11	10	10							7								
8	28.386	28.600	57.0	40.2	105.2	33.3	47.8	44.3	41.3	41.8	St. 0.2	St. 0.5		—	10	10							8								
9	28.970	27.750	54.1	34.2	75.7	30.3	45.8	45.3	42.8	41.8	St. 0.2	St. 1.5		0.80	10	10							9								
10	28.980	28.650	50.2	41.3	66.6	48.8	46.2	45.8	45.0	43.1	St. 1	St. 0.5		0.13	10	10							10								
11	28.870	28.720	54.0	35.3	104.0	33.3	44.0	41.2	48.8	46.8	St. 0	St. 1.5		0.09	10	10							11								
12	28.580	28.670	55.8	35.0	99.3	42.0	52.9	50.2	47.0	45.8	St. 1.5	St. 0.2		0.30	10	10							12								
13	28.520	28.410	55.8	42.0	83.4	37.3	44.1	44.1	47.0	46.3	St. 0	St. 0		0.65	10	10							13								
14	28.094	28.920	54.4	39.0	107.3	33.3	43.3	41.7	52.3	38.8	St. 0.2	St. 0.2		—	10	10							14								
15	29.100	28.958	55.0	27.5	111.0	25.0	52.2	54.8	44.4	44.3	St. 0	St. 0		—	10	10							15								
16	29.183	29.160	60.0	46.2	110.3	33.4	51.8	50.8	56.2	55.0	St. 0	St. 0		0.08	10	10							16								
17	29.144	29.150	62.0	44.0	110.0	35.5	57.9	53.9	45.4	44.7	St. 0	St. 0		—	10	10							17								
18	29.182	29.160	59.3	43.5	109.8	40.0	51.4	49.2	48.8	47.8	St. 0	St. 0.5		—	10	10							18								
19	29.082	29.036	57.8	41.0	94.8	37.3	53.6	52.4	52.8	51.7	St. 0.8	St. 1		—	10	10							19								
20	29.038	29.069	59.8	37.0	75.8	48.3	52.8	54.5	52.5	50.0	St. 1.5	St. 1		—	10	10							20								
21	29.116	29.146	63.8	38.2	108.8	33.4	49.5	48.0	47.9	47.8	St. 0	St. 0.5		—	10	10							21								
22	29.130	29.166	66.4	38.3	104.8	36.0	50.8	50.0	54.5	54.2	St. 0	St. 0.5		—	10	10							22								
23	29.174	29.200	67.2	41.2	105.3	38.0	51.7	50.5	47.3	47.3	St. 0	St. 0.5		—	10	10							23								
24	29.134	29.172	61.7	38.3	105.6	35.0	52.0	50.3	52.3	51.0	St. 0	St. 1		—	10	10							24								
25	29.200	29.150	68.2	41.0	105.4	33.7	46.2	45.7	53.8	53.0	St. 0	St. 0		—	10	10							25								
26	29.014	29.100	65.2	42.8	108.8	38.8	54.7	52.8	53.0	52.3	St. 0	St. 0.5		—	10	10							26								
27	29.230	29.232	59.5	47.3	60.8	46.2	49.0	48.0	57.1	57.8	St. 0	St. 0.2		—	10	10							27								
28	29.210	29.200	65.7	49.0	103.2	42.0	53.1	52.2	50.0	49.8	St. 0	St. 0		—	10	10							28								
29	29.212	29.300	66.5	41.0	103.0	36.0	56.0	54.0	49.5	49.2	St. 0	St. 0		—	10	10							29								
30	29.234	29.270	65.0	38.0	105.3	36.3	42.0	41.8	48.6	47.8	St. 0	St. 0		—	10	10							30								
31																								31							
Sums.		29.126	29.125	5140.4	116.6	111.3	44.4	44.4	113.4	110.4	96	183		12.5.68	182	162															
Means.		29.774	29.744	59.6	41.4	97.5	38.2	49.5	48.1	49.2	48.4	0.32	0.61		6.1	5.4															
† Total Corrections for Instrumental Errors.		-0.09	-0.09																												
‡ Corrections for Diurnal Range.																															
“Corrected Means.”		29.765	29.785																												
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†† for Temp. (Col. 2), = 28.705 712
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 28.727 737
Mean at Station, corrected, and at 32°, = 28.716 722
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 29.924
Highest Reading, corrected for Index error, on the 30 th, = 29.370
Lowest Do. Do., on the 9 th, = 27.750
Difference, or Monthly Range, = 1.620

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 15 th, = 69.2
Lowest in Month, corrected for Index errors, on the 15 th, = 24.5
Difference, or Monthly Range, = 44.7
“Corrected Mean” of all the Highest, (Col. 5), = 59.6
“Corrected Mean” of all the Lowest, (Col. 6), = 41.4
Difference, or Mean Daily Range, = 18.2
** Calculated Mean Temperature of Month, = 50.6
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the th, = 116.0
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 94.5
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = 25.0
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 38.2
Difference of above Means or Range (“exposed”), = 59.3

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 49.2
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 48.2
†† Computed Temperature of Dew-Point, = 47.1
†† Do. Elastic Force of Vapour, = 3.25
†† Do. Weight of Vapour in a Cubic Foot of Air, = 93
†† Relative Humidity, (Saturation = 100), = 93
RAIN fell on 12 Days; Amount in Inches, = 3.68

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	2	1	0	1	1	4	4		0.32		
P.M.	0	1	1	2	8	1	2	5		0.61		
Mean.	1	2	1	1	4	1	4	4	0	0.46		

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

Observations made and
Return verified by

(Signed)

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

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

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

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

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

An excellent Barometer is constructed by Mr. A. de 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; whereas passes freely through the jar 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 *evening*.

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 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 *slight lap* 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 replaced.

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

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

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

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "*Hygrometrical Deductions*," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the manikin must be of medium fineness, and fished 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 manikin 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°·3, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°; or 40°·3, 40°·2, or 40°·1, and 40°·3, 40°·2, or 40°·1 respectively. So also 40°·3, 40°·2, 40°·1, more or less must be respectively "*plus*," and "*minus*." The Thermometers, the reading Rutherford's "*plus*," and "*minus*." The Thermometers, the indication of that end of the index which is next to the scales 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 extreme may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d. **Wind.**—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the main 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, &c.

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "*Velocity*," 6, S, W, (for example) will indicate that the wind is blowing from the South-West, with a velocity of 6 miles per hour. In the column "*Direction*," 2, W, (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "*Cloud*" column, an entry of $\frac{2}{4}$, st., will indicate that the higher regions are covered to the "*amount*" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

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

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

Ozone.—Mention whether Schönbein's or Meiffert'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 fired as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; *i.e.*, that it is *blowing fresh*.

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

Remarks.—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of 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 sun, when in winter ought to be recorded.

By the use of observations, 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-marginal. Additional remarks may be made on the margin.

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

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

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

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

(By Order) A. B.

Edinburgh, 10th November 1850.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

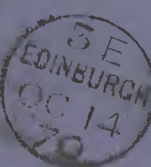
SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple,			Cuckoo,		
Bourtree or Elder,		Black Currant,			Curlew,		
Broom,		Cherry,			House-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Plover,		
Holly,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

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

EDINBURGH.

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

MR ALEXANDER BUCHAN,



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Braemar, County of Aberearn, in Lat. 57° 30', Long. W. 2° 00', Distance from Sea 60 miles.
Height of Cistern of the Barometer above Mean Sea-level 114 feet, above Ground 5 feet. During the MONTH of October 1870.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. —				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.	
		9 h. A.M.		9 h. P.M.		Protected in Shade 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.										
		Barometer, No.	Atmospheric Thermometer	Barometer, No.	Atmospheric Thermometer	Max. No.	Min. No.	Max. in Sun rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H. Cup Anemometer, No. —	No. of hours in which it fell.	Amount in inches.	Velocity (0-10), and Species.	Velocity (0-10), and Species.	No. 8 inches.	No. 12 inches.	No. 22 inches.							
		inches.	°	inches.	°	No.	No.	No.	No.									9 h. A.M.						Hours.								
	1	29.406	29.432	68.2	34.0	109.5	58.8	40.0	59.0	41.6	47.0	SW	0	S	0.2												Beau. day. A.M. fine. Storm P.	1				
	2	29.394	29.364	68.2	28.0	112.5	24.8	58.2	57.3	38.0	37.5	SW	0	SW	0												Beau. day. fine.	2				
	3	29.294	29.380	66.2	28.0	109.0	26.2	57.0	56.0	39.0	38.2	SW	0	SW	0.5												Clear & Sunshine all day.	3				
	4	29.350	29.352	67.8	28.2	110.2	24.5	56.8	55.0	39.0	38.8	SW	0	SW	0												Beau. day. fine.	4				
	5	29.270	29.150	58.8	26.2	58.8	25.8	54.5	54.0	45.0	45.0	NE	0	NE	0												Dark and dull.	5				
	6	28.960	28.820	50.0	59.0	61.5	29.2	44.8	43.0	46.0	45.8	SW	0	SW	0												Beau. day.	6				
	7	28.682	28.550	48.1	58.2	46.8	56.5	39.5	39.0	44.0	43.0	NE	0	NE	0	0.08											Showy & clear.	7				
	8	28.260	28.060	44.3	34.0	35.7	29.0	37.8	37.0	36.2	35.2	NE	0	NE	0.25	0.14											Beau. day.	8				
	9	28.000	28.034	42.0	32.7	34.6	26.8	36.0	35.0	36.7	35.8	SE	0	SE	0.2	0.04											Sun & clear.	9				
	10	28.292	28.430	48.9	38.6	60.0	29.5	38.0	36.2	38.7	38.0	SW	0.5	SW	0.2	0.08											Sun & clear.	10				
	11	28.536	28.600	49.0	35.0	70.0	17.0	47.0	39.1	56.7	56.0	SW	1.5	SW	0	0.50											Sun & clear.	11				
	12	28.368	27.950	46.2	36.0	63.7	25.1	40.0	40.0	42.1	42.0	SE	0	SE	0	0.44											Sun & clear.	12				
	13	28.292	28.650	45.8	38.7	67.0	26.8	48.0	44.9	59.0	59.0	NE	0	NE	0.2	0.14											Sun & clear.	13				
	14	28.766	28.766	46.5	25.0	37.0	25.0	28.0	27.8	33.0	33.0	NE	0	NE	0												Sun all day. A.P. & P.	14				
	15	28.652	28.578	47.8	27.2	79.5	23.0	36.3	36.2	45.0	45.3	SW	0	S	1.5	0.52											Sun & fine.	15				
	16	27.826	27.714	53.5	47.7	64.0	42.1	37.5	36.8	47.3	48.8	SE	1	SE	0.2	0.28											Sun & fine.	16				
	17	28.850	28.272	48.2	34.8	59.5	34.3	42.7	41.2	58.3	58.8	SW	1	SW	0.5												Sun.	17				
	18	28.504	28.200	46.5	35.8	58.0	28.7	37.8	38.8	46.0	45.0	SW	0.2	SW	1.5	0.68											Sun.	18				
	19	27.950	27.820	49.8	40.0	58.8	29.8	46.8	45.0	41.0	40.7	SW	1	SW	1	0.27											Sun.	19				
	20	27.900	28.482	47.0	38.0	53.7	35.8	41.0	40.4	45.3	44.0	NE	0	NE	1	0.07											Sun.	20				
	21	28.686	28.600	50.4	38.8	73.8	29.3	35.3	35.3	45.8	45.0	SW	0	SW	0	0.08											Sun.	21				
	22	28.394	28.150	53.3	38.2	72.1	33.3	50.0	48.8	59.5	39.5	SW	1	SW	0	0.50											Sun.	22				
	23	27.580	27.352	48.2	38.3	61.7	36.0	44.8	44.0	46.0	45.2	SE	1	S	0.2	0.16											Sun.	23				
	24	27.420	27.700	49.3	42.3	60.5	31.5	44.3	43.7	45.3	44.5	SW	0	SW	0.2	0.10											Sun.	24				
	25	27.920	28.100	46.6	35.8	69.3	32.8	41.0	39.8	58.0	57.2	SW	1	SW	1.5	0.02											Sun.	25				
	26	28.058	28.080	45.1	36.5	72.8	33.3	59.3	58.8	58.0	58.0	SW	0.2	SW	0.5	0.03											Sun.	26				
	27	28.048	28.268	47.8	36.2	60.5	31.5	40.0	39.0	41.0	40.2	SW	0.2	SW	0.2												Sun.	27				
	28	28.432	28.624	46.8	32.2	55.0	28.0	41.8	41.0	42.8	40.2	SW	0	SW	0.5	0.43											Sun.	28				
	29	28.510	28.432	46.3	34.0	49.3	31.0	38.2	37.8	39.3	38.0	SW	0	SW	0.5	0.46											Sun.	29				
	30	28.424	28.268	45.7	34.1	55.2	30.0	39.3	37.8	39.2	39.0	SW	0	SW	1.5	0.23											Sun.	30				
	31	28.364	28.920	45.8	38.0	47.0	32.8	40.0	38.2	44.6	43.2	SW	0	SW	0.5												Sun.	31				
	Sums.	28.1548	28.1326	518.12	317.8	615.11	316.13	359.38	381.1	418.9	416.8					4.08																
	Means.	28.461	28.429	50.3	34.7	68.1	30.1	39.8	38.9	41.3	40.4	0.31	0.52	4.8	7.4	7.5																
	† Total Corrections for Instrumental Errors.	-0.09	-0.09																													
	† Corrections for Diurnal Range.																															
	"Corrected Means"	28.452	28.439																													
	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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† for Temp. (Col. 2), = 28.423
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 28.408
Mean at Station, corrected, and at 32°, = 28.416
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 29.618
Highest Reading, corrected for Index error, on the 1 th, = 29.432
Lowest Do. Do., on the 23 th, = 27.352
Difference, or Monthly Range, = 2.080

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 2 th, = 68.2
Lowest in Month, corrected for Index errors, on the 14 th, = 25.0
Difference, or Monthly Range, = 43.2
"Corrected Mean" of all the Highest, (Col. 5), = 50.3
"Corrected Mean" of all the Lowest, (Col. 6), = 34.4
Difference, or Mean Daily Range, = 15.6
* Calculated Mean Temperature of Month, = 42.5
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 2 th, = 112.5
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 68.1
Lowest at Night, Black Bulb, (corrected for Index errors), on the 15 th, = 23.0
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 30.1
Difference of above Means or Range ("exposed"), = 38.1

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 40.6
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 39.6
†† Computed Temperature of Dew-Point, = 38.4
†† Do. Elastic Force of Vapour, = 23.2
†† Do. Weight of Vapour in a Cubic Foot of Air, = 92
†† Relative Humidity, (Saturation = 100), = 92
RAIN fell on 19 Days; Amount in Inches, = 4.00

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	6	3	1	1	1	2			0.31	
P.M.	1	6	0	1	3	1	4			0.82	
Mean.	1	6	0	2	2	1	3	0		0.42	0.18

† Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S." and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
†† The Diurnal Range for Scotland is as yet unknown.
†† These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition only.
†† While the Diurnal Range is unknown, the Arithmetic Mean of Cols. 9 and 11 will be entered as the "Calculated Mean Temperature."
†† Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

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

Observations made and
Return verified by

(Signed)

C

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Breman, County of Aberdeen, in Lat. 57° 14', Long. 2° 24', Distance from Sea 60 miles.Height of Cistern of the Barometer above Mean Sea-level 114 feet, above Ground 5 feet.During the MONTH of November 1870.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.				
		9 h. A.M.		9 h. P.M.		Protected in Shade 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.												
		Barometer. No.	Attach- ed Ther- mometer	Barometer. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	No.	inches.	No.					inches.	No.	inches.	Temperature of WELL at depth of feet. No.
		inches.		inches.																														
16	1	29.220		28.260		49.4	58.0	58.4	29.8	54.8	54.2	41.7	40.8	SW 0	SW 0.5																	Fair & Sunshiny	1	
17	2	29.188		29.150		48.4	58.9	54.3	34.3	42.8	44.0	46.0	45.0	SW 0	SW 0.5																	Do Do	2	
18	3	28.214		28.500		50.3	40.2	65.2	16.3	45.0	44.0	42.3	41.3	SW 1.	SW 0.2																	Do Do	3	
19	4	29.280		28.500		47.5	31.0	54.0	28.0	38.7	44.0	39.8	38.4	SW 0.	SW 0.																	Do Do	4	
20	5	29.266		29.150		46.3	32.0	56.3	28.3	38.0	44.0	42.8		SW 0.	SW 0.																	Light Am. Fin	5	
21	6	28.574		28.850		46.3	33.4	56.8	31.4	40.0	39.3	36.0	36.0	SW 0.2	SW 0.																	Fair & Sunshiny	6	
22	7	28.870		28.850		44.2	31.3	55.4	28.8	32.0	32.0	32.0	31.3	SW 0.	SW 0.																	Light Am. Fin	7	
23	8	28.900		28.850		40.8	28.8	48.0	21.2	31.2	30.8	28.8	28.2	SW 0.	SW 0.																	Clear Fin & S.	8	
24	9	28.762		28.650		39.9	28.2	45.3	21.8	33.3	33.0	30.7	30.0	SW 0.	SW 0.	0.25																Fair & Diff.	9	
25	10	28.482		28.632		40.2	28.2	45.0	25.2	33.0	32.8	32.3	32.0	SW 1.	SW 1.5	0.07																Do Do	10	
26	11	28.580		28.550		39.2	30.0	44.2	30.0	32.8	32.0	31.6	31.6	SW 1.	SW 1.	0.25																Do Do	11	
27	12	28.220		28.200		38.4	27.8	52.6	27.0	31.0	31.0	30.6	30.2	SW 1.	SW 1.	0.06																Do Do	12	
28	13	28.574		27.952		39.2	28.8	52.8	26.3	36.0	34.8	30.0	29.3	SW 0.5	SW 0.	0.05																Do Do	13	
29	14	27.874		27.910		37.4	25.0	42.5	25.0	31.3	31.0	27.0	27.0	SW 0.	SW 0.	0.40																Do Do	14	
30	15	27.824		28.000		38.3	25.6	52.8	25.2	35.3	34.7	36.1	35.1	SW 0.	SW 0.5	0.11																Light & dull Light	15	
31	16	28.020		28.100		39.6	31.1	46.0	31.0	36.0	34.9	35.3	35.0	SW 1.	SW 0.5	0.11																Shony	16	
32	17	28.200		28.200		38.9	33.5	46.9	26.7	36.2	35.4	32.0	36.9	SW 0.	SW 0.5																	Raw & Light	17	
33	18	28.270		28.120		38.0	26.7	52.0	26.8	34.0	33.9	26.0	26.0	SW 0.	SW 0.																	Fair & fresh	18	
34	19	27.920		27.974		36.9	30.0	52.7	29.3	35.5	35.5	36.0	35.6	SW 0.	SW 0.																	Shony all day	19	
35	20	27.980		28.046		40.2	32.6	60.0	27.8	35.0	34.7	38.0	37.7	SW 0.	SW 0.	0.58																Do Do	20	
36	21	27.964		27.850		41.0	34.3	62.7	28.3	41.0	40.2	37.3	37.0	SW 0.	SW 0.	0.48																Rainy	21	
37	22	27.960		27.872		39.2	26.8	71.0	24.8	32.0	31.8	28.9	27.7	SW 0.	SW 0.																	Fair	22	
38	23	27.870		27.950		26.0	22.4	10.8	20.2	24.0	24.0	31.8	31.8	SW 0.	SW 0.																	Do & Windy all day	23	
39	24	27.940		27.880		44.6	29.0	56.7	26.7	32.0	31.7	44.0	43.3	SW 0.	SW 0.																	Do	24	
40	25	27.784		28.164		44.0	36.7	49.7	30.4	41.0	40.8	38.0	38.0	SW 0.	SW 0.	0.06																Light Am. Fin & Ph	25	
41	26	28.554		28.550		45.0	29.5	50.0	30.0	36.7	36.0	32.7	32.0	SW 0.	SW 0.																	Fair & fresh	26	
42	27	28.950		29.024		44.0	28.7	52.6	25.3	32.0	31.0	29.8	29.0	SW 0.	SW 0.																	Do	27	
43	28	29.050		29.050		45.0	26.0	52.6	25.0	32.0	31.0	30.0	30.0	SW 0.	SW 0.																	Calm all day	28	
44	29	29.116		29.190		44.3	26.7	52.8	22.3	32.0	31.7	31.0	30.8	SW 0.	SW 0.																	Do	29	
45	30	29.250		29.444		47.6	29.7	49.3	24.8	34.0	34.0	35.8	34.0	SW 0.	SW 0.																	Do Do	30	
46	31																																	
Sums.		28.16146		28.13124		417.8	315.2	413.3	214.1	310.6	312.3	149.3	148.8			2.45																		
Means.		15.458		15.900		18.602	6.870	13.511	10.901	14.613	13.06					9.2																		
Corrections for Instrumental Errors.		-0.009		-0.009												0.31																		
Corrections for Diurnal Range.																																		
Corrected Means.		28.506		28.521						3.38	3.42																							
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++ for Temp. (Col. 2), = 28.491
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ for Temp. (Col. 4), = 28.521
Mean at Station, corrected, and at 32°, = 28.498
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 29.700
Highest Reading, corrected for Index error, on the 30 th, = 29.444
Lowest Do. Do., on the 25 th, = 27.484
Difference, or Monthly Range, = 1.660

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 3 th, = 50.3
Lowest in Month, corrected for Index errors, on the 23 th, = 22.4
Difference, or Monthly Range, = 27.9
"Corrected Mean" of all the Highest, (Col. 5), = 40.6
"Corrected Mean" of all the Lowest, (Col. 6), = 30.1
Difference, or Mean Daily Range, = 10.5
Calculated Mean Temperature of Month, = 34.9
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 20 th, = 41.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 32.9
Lowest at Night, Black Bulb, (corrected for Index errors), on the 20 th, = 20.2
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 24.2
Difference of above Means or Range ("exposed"), = 15.4

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 34.6
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 34.0
Computed Temperature of Dew-Point, = 33.8
Do. Elastic Force of Vapour, = 1.94
Do. Weight of Vapour in a Cubic Foot of Air, = 95
Relative Humidity, (Saturation = 100), = 95
RAIN fell on 11 Days; Amount in Inches, = 2.45

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day.
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.		
A.M.		3	1	1	3	2	14	3	3		0.26	
P.M.		3	0	0	1	6	16	3	4		0.31	
Mean.		3	0	1	2	1	15	3	5	0	0.28	0.08

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

Observations made and
Returns verified by

(Signed)

6

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

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

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

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

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

An excellent Barometer is constructed by Mr. A. de London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-bulbs* 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 condensation 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 *join one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary setting* must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *serve up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern 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 lighting 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 inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and set the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, *Self-registering Thermometers*—Professor Phillips's, and Negretti and Zamboni's Patent "*Marine*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Kitchner 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 sticking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

Application 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, under no repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "*Minimum*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "*Hygrometrical Deductions*," Observers are specially requested to attend to the following conditions:—

The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side and a little below the level of the wet bulb;—in no case must the bulb;—the bulb must be of medium fineness, and fissured at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer, that the muslin is always *clean*, and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes, before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances. One form of "*Mason's*" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water-cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column of mercury*. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under an exact coincidence with, or a little over 40°. or 40½, or 40¾, respectively. So also 41½, and 40¾, more or less must be registered 40° 2 or 40° 3, and 40° 7 or 40° 8 respectively. In reading Kitchner's "*Marine*" 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 thermometer, 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, their extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 2d are those of a series of phenomena commencing at 9 P.M. on the 2d and extending till 9 P.M. on the 3d.

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

Careful observations ought to be made on the changes in the direction of the wind, and during storms, it is earnestly recommended that extra observations be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results. The Council recommend that every observatory be furnished with a *Thermospherical 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, Lind's Anemometer is also recommended; the method of *Estimating Wind Force* by such tables as that given in the schedule is to say the least, unsatisfactory.

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

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

Clouds.—Convenient abbreviations for Luke Howard's

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "*Velocity and Direction*," 2 W. (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "*Cloud*" column, an entry of $\frac{2}{3}$ (i.e., $\frac{2}{3}$) will indicate that the higher regions are covered to the "amount" of 4 tenths with *strata* clouds; and that the sky is further observed to that of our island, a very important branch of Meteorology. The Council therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by the heat of river water. At or near the time of high water, on the 5th, 15th, and 20th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When conveniently, 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 Schumbein's or Mollat'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. The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no table can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such abbreviations 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 *precipitations*, green prominence in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of observations, 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 could direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *ten day* observations be taken;—viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

MR ALEXANDER BUCHAN,
General Post Office Buildings,
Edinburgh.
Secretary of the Meteorological Society of Scotland.
Nov 1870
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Nov 1870

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Praeger, County of Argyll, in Lat. 57° 11', Long. 5° 24' E, Distance from Sea 60 miles.Height of Cistern of the Barometer above Mean Sea-level 1114 feet, above Ground 3 feet.During the MONTH of December 1870.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.				
		9 h. A.M.		9 h. P.M.		Protected in Shade & 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.										
		Barometer.	Atmos- phere.	Barometer.	Atmos- phere.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H. Cup Anemometer. No.	No. of hours in which it fell.	Amount in inches.	Velocity (0-10), and Direction.	Amount, (0-10), and Species.	Velocity (0-10), and Direction.	Amount, (0-10), and Species.					No. 1. inches.	No. 2. inches.	No. 3. inches.	
		No.	inches.	No.	inches.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.					No.	No.	No.	No.
	1	29.372		29.374		36.0	25.8	60.7	25.8	32.0	31.9	32.0	32.0	N	0	N	0												Frosty	1		
	2	29.400		29.342		35.0	25.0	56.0	22.1	30.0	27.8	34.5	34.0	N	0	N	0												Fair	2		
	3	29.250		29.262		40.0	35.6	58.3	30.7	36.0	35.8	38.0	37.9	N	0.5	N	0.5												Fair & B. S.	3		
	4	29.234		29.174		45.6	32.7	60.0	29.3	40.0	40.0	39.7	39.0	N	1	N	1												B. S.	4		
	5	29.200		28.880		46.5	33.7	63.5	30.0	38.0	34.6	35.2	35.0	N	0	N	0.5												Sun & drif.	5		
	6	28.862		28.772		48.0	29.0	48.0	23.7	37.8	37.0	27.0	37.0	N	0	N	1		0.20										B. S.	6		
	7	28.720		28.632		40.0	25.8	49.7	22.8	27.3	27.0	28.0	24.9	N	0.2	N	0.2													B. S.	7	
	8	28.600		28.810		35.0	24.2	56.8	24.2	32.0	32.0	33.0	32.7	N	0	N	0													B. S.	8	
	9	28.900		28.972		38.0	25.4	50.7	28.0	34.0	33.6	38.0	35.0	N	0	N	0.2													B. S.	9	
	10	29.000		28.864		35.7	26.8	59.8	22.5	32.0	32.0	29.0	29.0	N	0	N	0													B. S.	10	
	11	28.662		28.440		31.8	24.8	47.9	22.9	25.0	24.9	28.4	28.0	N	0	N	0													B. S.	11	
	12	28.182		27.950		33.6	21.8	45.5	19.8	24.0	23.7	33.5	33.0	N	0	N	0													B. S.	12	
	13	28.174		28.278		35.0	30.2	50.6	23.7	34.0	33.5	34.5	34.0	N	0	N	0													B. S.	13	
	14	27.980		27.562		35.0	25.8	45.5	20.6	35.8	35.8	37.0	36.9	N	0	N	0													B. S.	14	
	15	27.800		28.290		43.0	30.7	47.0	25.0	38.6	37.3	32.0	32.0	N	0	N	0		1.00											B. S.	15	
	16	28.500		28.600		43.4	29.8	56.8	27.9	30.0	29.9	31.0	31.1	N	0	N	0														B. S.	16
	17	28.712		28.750		36.0	27.3	63.7	26.8	35.4	35.5	32.0	32.0	N	0	N	0														B. S.	17
	18	28.500		28.360		43.8	26.6	52.8	23.8	32.6	32.0	40.3	42.7	N	0	N	0.5														B. S.	18
	19	28.350		28.250		43.0	34.5	50.0	32.0	41.8	41.0	38.5	38.4	N	0	N	0.5		0.75												B. S.	19
	20	28.350		28.560		39.0	28.5	49.5	28.7	38.4	37.4	31.0	31.0	N	0	N	0.2														B. S.	20
	21	28.800		28.850		38.0	10.0	47.7	14.3	28.0	22.6	20.0	19.7	N	0	N	0														B. S.	21
	22	28.800		28.800		39.8	7.0	33.7	7.0	10.0	9.8	7.4	7.0	N	0	N	0														B. S.	22
	23	28.750		28.800		37.8	0.1	35.0	0.0	19.8	19.0	22.5	22.5	N	0	N	0														B. S.	23
	24	28.350		28.400		38.7	13.0	38.7	14.9	28.8	28.8	25.3	25.8	N	0.2	N	0														B. S.	24
	25	28.536		28.658		31.0	21.8	50.3	12.5	30.0	30.0	29.0	28.7	N	0.5	N	1.5														B. S.	25
	26	28.812		28.720		28.7	6.5	52.7	4.0	24.3	21.0	5.0	0.6	N	0	N	0.2														B. S.	26
	27	28.650		28.718		26.9	5.7	50.5	3.7	6.5	6.0	5.5	5.0	N	0	N	0														B. S.	27
	28	28.800		28.846		32.0	10.7	49.0	7.6	19.5	19.0	22.3	22.0	N	0	N	0														B. S.	28
	29	28.950		28.958		33.3	11.6	50.7	8.8	30.0	30.0	28.5	28.0	N	0.2	N	0														B. S.	29
	30	28.000		29.084		34.0	12.8	48.8	9.6	27.6	27.0	26.7	26.2	N	0	N	0														B. S.	30
	31	28.800		28.282		36.0	11.7	49.7	8.5	27.0	27.0	25.7	25.0	N	0	N	0														B. S.	31
Sums.		281682		281846		315742	1415	516157	1313	2127	2149	215	82156		1	3			1.65		216		201									
		21998		21388		1929	431	33127	4925	90278	9263	12534		66	72																	
Means.		28.710		28.690		36.222	45.11	18.929	32.90	28.528	2	0.21	0.23								7.0		6.5									
+ Total Corrections for Instrumental Errors.		-009		-009																												
+ Corrections for Diurnal Range.		28.701																														
"Corrected Means."		28.701		28.681						28.9	28.1																					
No. of Columns.		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 (†) = 28.709
for Temp. (Col. 2), = 28.710 - 0.001
"Corrected Mean" of Barometer at 9 P.M., minus the Correction (†) = 28.682
for Temp. (Col. 4), = 28.681 - 0.001
Mean at Station, corrected, and at 32°, = 28.696
Correction for height, feet above Mean Sea-level, = 1.202
Mean, reduced to 32°, and Sea-level, = 29.898
Highest Reading, corrected for Index error, on the 1 th, = 29.400
Lowest Do. Do. on the 14 th, = 24.562
Difference, or Monthly Range, = 1.838

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 5 th, = 46.3
Lowest in Month, corrected for Index errors, on the 23 th, = 00.0
Difference, or Monthly Range, = 46.3
"Corrected Mean" of all the Highest, (Col. 5), = 36.2
"Corrected Mean" of all the Lowest, (Col. 6), = 22.4
Difference, or Mean Daily Range, = 13.8
"Calculated Mean Temperature of Month, = 29.3

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 17 th, = 63.4
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 51.1
Lowest at Night, Black Bulb, (corrected for Index errors), on the 23 th, = 00.0
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 19.9
Difference of above Means or Range ("exposed"), = 31.2

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 28.9
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 28.65
Computed Temperature of Dew-Point, = 26.9
Do. Elastic Force of Vapour, = 1.32
Do. Weight of Vapour in a Cubic Foot of Air, = 80
Relative Humidity, (Saturation = 100), = 80
RAIN fell on Days; Amount in Inches, = 1.95

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calms or Variable.
A.M.		3	6	0	5	2	9	4	2	0.21
P.M.		3	9	0	2	0	12	2	3	0.23
Mean.		3	8	0	3	1	10	3	3	0.22

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

Observations made and
Return verified by

(Signed)

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

One of the objects of immediate importance that the Scottish Meteorological Society has proposed to itself, is to secure 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 incomparably, 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 comparability among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

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

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

Two moderate-priced Barometers have been approved of by the Council: if properly tested and attended to, they are both well adapted to Meteorological purposes. An excellent Barometer is constructed by Mr. Aikin of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-tubules* are not more than six 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 flint-glass, 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 *back-screw* on this little piston-rod is brought by the adjusting screw, so *far* as *one strength 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 *aneroid*.

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* the tube, 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 introducing the instrument so that the mercury strikes the top of the tube, a *slump* *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 inside, and fixed 4 feet above grass in an exposed position, free from every local influence. The latins forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians *Self-registering Thermometers*.—Professor Phillips, and N. Agretti and Zambrini's Patent "Macxium" Thermometers are recommended: printed directions for their use may be obtained from each instrument. The "Minimum" Thermometer of Bartholomew is recommended when graduated on the glass from and affixed to a frame separate from the "Macxium." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *columns* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the top of the tube, and must be dislodged from thence near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid.

These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the accepted 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—by a 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 mouth 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 mouth 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 top 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, 40° 2', or 40° 4', according as it indicates a little again, 40° 24', 40° 20', or 40° 48', according as it indicates 40° 2', 40° 4', 40° 6', an exact coincidence with, or a little over 40° 2', 40° 4', 40° 6', respectively. So also 44° 1', and 40° 3', more or less must be registered 40° 2' or 40° 4', and 40° 7', 40° 8' respectively. In reading Bartholomew's "Glass," and "Miles" Thermometers, the reading 40° 2' or 40° 4', and 40° 7', 40° 8' respectively. In 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, in snow, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological *day*. In the Society's schedules, the indications registered on the 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

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

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

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

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

Snowfalls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, 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 *cloud* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on.

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

Sunshine.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column. **Underground Thermometers.**—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. 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 29th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. **Ozone.**—Mention whether Schönbein's or Meißner's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3°, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale 0-6 is "4"; i.e., that it is *bleeding freely*.

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 Electro-meter is necessary to every complete meteorological observatory.

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

Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, 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 Electro-meter 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 *year day* observations be taken; viz., on the 21st days of March, June, September, and December.

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

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

(By Order) A. B. BARNARD, 20th November 1870.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

MR ALEXANDER BUCHAN, Secretary of the Meteorological Society of Scotland, General Post Office Buildings, EDINBURGH.



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