

SCOTTISH METEOROLOGICAL SOCIETY.

<b>BAROMETER,</b>	"corrected Mean" at 9 A.M., minus the Correction ++	=	29.694
	for Temp. (Col. 2), = 29.695 - .001	=	
	"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++	=	
	for Temp. (Col. 4), =	=	
<b>Mean at Station, corrected, and at 32°,</b>		=	29.604
Correction for height,	feet, above Mean Sea-level, .....	=	.209
<b>Mean, reduced to 32°, and Sea-level,</b>		=	29.8123
Highest Reading, corrected for Index error, on the	9 <sup>th</sup> , .....	=	30.200
Lowest Do.,	Do., on the	=	28.530
Difference, or <b>Monthly Range,</b>		=	1.670

<b>S.-R. THERMOMETER,</b>	(in shade, etc.),	<b>Highest in Month,</b>	(corrected for	
Index Errors),	on the	9	th,	= 57.6
<b>Lowest in Month,</b>	corrected for Index errors,	on the	1	th, = 27.1
Difference, or <b>Monthly Range,</b>				= 25.5
"Corrected <b>Mean</b> "	of all the <b>Highest,</b>	(Col. 5),	= 49.0	
"Corrected <b>Mean</b> "	of all the <b>Lowest,</b>	(Col. 6),	= 36.2	
Difference, or <b>Mean Daily Range,</b>				= 12.8
** Calculated <b>Mean Temperature</b>	of Month,	= 42.6		

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

<b>HYGROMETER, Mean</b> (corrected) A.M. and P.M. Reading of <b>Dry Bulb</b> , (Cols. 9 and 11),.....	=	41.6
<b>Mean</b> (corrected) A.M. and P.M. Reading of <b>Wet Bulb</b> , (Cols. 10 and 12),.....	=	39.88
†† Computed <b>Temperature of Dew-Point</b> ,.....	=	37.85
†† Do. <b>Elastic Force of Vapour</b> , .....	=	2286
†† Do. <b>Weight of Vapour in a Cubic Foot of Air</b> , .....	=	
†† <b>Relative Humidity</b> , (Saturation = 100), .....	=	88 8%
<b>RAIN</b> fell on 10 Days; Amount in Inches, .....	=	1.94

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day.
	Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.		
A.M.	0	0	1	1	10	16	2	1	0			
P.M.	0	1	1	4	10	6	8	1	0			
Mean.	0	1	1	2	10	11	5	1	0			

Observations made and  
Return verified by

(Signed) \_\_\_\_\_



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

ONE of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for 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. Adee 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 screws, to form one straight line with those on its ivory frame, the index-line on this little piston-rod is brought, by the adjusting 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 lip is produced. If this is prevented by air, the tube may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by agitating the ivory peg), and gently tapping it; and if this plan fails, the instrument should be repaired.

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

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

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

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

The above remarks apply equally to the Thermometers for

regions, the greatest heat from the sun's rays, and the least amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky on *cloud C. i.* 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 amounts 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; times, when the sky overcast 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," S. W.

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  $\frac{1}{4}$ , (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.

**Shading.**—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 temperature 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 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  $\frac{3}{8}$  S.W., as an ozone entry in the schedule, will indicate that the ozone paper is tinted as  $\frac{3}{8}$  on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4," i.e., that it is *blowing fresh*.

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

**Remarks.**—The "Remarks" column is too narrow, but unavoidable so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of; and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms 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 purposes, 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 *ann day* observations be taken;—viz., on the 21st days of March, June, September, and December.

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

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

(By Order) A. B.

LONDON: 22, DORSET STREET.

Clouds.— Convenient abbreviations for the Howard's

nature of deduction or inference.

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 on *cloud C. i.* 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 amounts 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; times, when the sky overcast 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," S. W.

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  $\frac{1}{4}$ , (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.

**Shading.**—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 temperature 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 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  $\frac{3}{8}$  S.W., as an ozone entry in the schedule, will indicate that the ozone paper is tinted as  $\frac{3}{8}$  on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4," i.e., that it is *blowing fresh*.

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

**Remarks.**—The "Remarks" column is too narrow, but unavoidable so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of; and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms 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 purposes, 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 *ann day* observations be taken;—viz., on the 21st days of March, June, September, and December.

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

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

(By Order) A. B.

LONDON: 22, DORSET STREET.

Clouds.— Convenient abbreviations for the Howard's

nature of deduction or inference.

nature of deduction or inference.

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

SHRUBS, &C.		FRUITS.														MIGRATORY BIRDS.		First in Season.		First in Season.	
First in Season.	Blossom.	Apple.	Black Currant.	Cherry.	Grape.	Gooseberry.	Holly.	Lambert.	Lilac.	Moreen.	Mountain Ash or Rowan.	Red Flowering Currant.	Rhododendron Ponticum.	Strawberry.	Thorn.	Thorn.	Thorn.	Thorn.	Thorn.		



# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Saltkirk Gardens, County of Mid-Lothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 3 miles.

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

During the MONTH of February 1869.

The Hours of Observation are of Greenwich Time.

BAROMETER, "corrected Mean" at 9 A.M., <i>minus</i> the Correction $\pm$	
for Temp. (Col. 2), = $29.551$ - $0.06$	= $29.515$
"Corrected Mean" of Barometer at 9 P.M., <i>minus</i> the Correction $\pm$	
for Temp. (Col. 4), = .....	= $29.515$
Mean at Station, corrected, and at $32^{\circ}$ , .....	=
Correction for height, feet, above Mean Sea-level, .....	= $.209$
Mean, reduced to $32^{\circ}$ , and Sea-level, .....	= $29.724$
Highest Reading, corrected for Index error, on the $15$ th, .....	= $30.000$
Lowest Do., Do., on the $1$ th, .....	= $28.850$
Difference or Monthly Range, .....	= $1.450$

<b>S.-R. THERMOMETER,</b> (in shade, etc.), <b>Highest in Month,</b> (corrected for Index Errors), on the <u>5</u> th, .....	= <u>57.6</u>
<b>Lowest in Month,</b> corrected for Index errors, on the <u>28</u> th, .....	= <u>29.2</u>
Difference, or <b>Monthly Range,</b> .....	= <u>28.4</u>
" Corrected <b>Mean</b> " of all the <b>Highest,</b> (Col. 5), .....	= <u>47.6</u>
" Corrected <b>Mean</b> " of all the <b>Lowest,</b> (Col. 6), .....	= <u>38.0</u>
Difference, or <b>Mean Daily Range,</b> .....	= <u>9.6</u>
** Calculated <b>Mean Temperature</b> of Month, .....	= <u>42.8</u>

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

<b>HYGROMETER, Mean</b> (corrected) A.M. and P.M. Reading of <b>Dry Bulb</b> , (Cols. 9 and 11), .....	=	43.1
<b>Mean</b> (corrected) A.M. and P.M. Reading of <b>Wet Bulb</b> , (Cols. 10 and 12), .....	=	<del>41.5</del> 40.9
†† Computed <b>Temperature of Dew-Point</b> , .....	=	<del>45.2</del> 38.3
†† Do. <b>Elastic Force of Vapour</b> , .....	=	<del>2.57</del> 2.31
†† Do. <b>Weight of Vapour in a Cubic Foot of Air</b> , .....	=	
†† <b>Relative Humidity</b> , (Saturation = 100), .....	=	<del>86</del> 83
<b>RAIN</b> fell on <u>8</u> Days; Amount in Inches, .....	=	2.38

WIND.		SUMMARY.									
Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	1	1	0	5	13	6	2	0		
P.M.	0	1	1	0	5	14	5	2	0		
Mean.	0	1	1	0	5	14	5	2	0		

Observations made and  
Return verified by

(Signed) \_\_\_\_\_



WITH REMARKS ON THE USE OF INSTRUMENTS.

Two moderate-priced Barometers have been approved by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes. The one is of cotton, which also supplies it with water. It must be seen to the observer that the msnsh is always *clean* and *moist*, and the water pure. In frosty weather observan is a matter of much

An excellent Barometer is constructed by Mr. Adair of London, the use of which is attended with the great convenience of requiring no adjustment of the system. Its *saults* or errors are not more than one or two inches but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the scales of the *externa* are of leather, and thus, by the use of a screw acting on the bottom, the surface of the contained mercury may be raised or lowered at pleasure, so that the foremen-

mercury can be adjusted to the *zero-point* of the fixed scale, whose coincidence being indicated by a little ivory foot, 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* reading must be made with the same accuracy; a small error in the adjustment will make the subsequent accuracy; a small error in the reading of the *Thermometer*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The readings ought to be taken to tenths of a degree, and noted in decimals. Thus the *Thermometer* will be read— $39.9^{\circ}$ ,  $40.0^{\circ}$ ,  $40.1^{\circ}$ ; or again,  $40.4^{\circ}$ ,  $40.7^{\circ}$ , or  $40.6^{\circ}$ —according as it indicates a little under an exact coincidence with, or a little over  $40^{\circ}$ , or  $40.5^{\circ}$  respectively. So also  $40.3^{\circ}$ ,  $40.7^{\circ}$ , or  $40.8^{\circ}$  must be taken.

When a Barometer having adjustable surfaces has to be used, the ivory peg must be screwed so that the surface of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the thermometer, especially of the wet and dry bulbs must be taken rapidly, being so readily affected by heat from the person observing. Before suspending the Barometer for use, the eastern unimost. Before suspending the Barometer for use, the eastern unimost.

to be observed. *Self-registering Thermometers.* 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 schedule the indications registered

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 thermometer 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 accurate adjustment and reading of the Barometer.

**Protection of Thermometers.**—The Council of the Societies recommend that Self-registering Thermometers and Hygrometers be fixed in a box, painted white outside, black within, and enclosed 4 feet above the ground in an exposed position, free from 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 crossstays, in the centre of

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

OST.

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	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

THE SEASONS  
In Ear  
or Flower.

[illegible][illegible]

Barley, .  
Bere or F  
Oats, .  
Wheat, .  
Beans, .  
Pease, .  
Potatoes,  
Turnips,  
Rye Grass  
mentioned

[illegible][illegible]

FOREST TREES	
Alder, . . . . .	1
Asp., . . . . .	1
Beech, . . . . .	1
Birch, . . . . .	1
Elm, . . . . .	1
Larch, . . . . .	1
Limb., . . . . .	1
Oak, . . . . .	1
Sycamore or Plat.	1

[illegible]



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalrymple Gardens, County of Mid Lothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of March 1869.

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 occurrences of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.		Days of Month.				
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.												
		Barometer.	Atmos- pheric No.	Barometer.	Atmos- pheric No.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0-8), and Direction.	Amount, (0-10), and Species.	Velocity, (0-8), and Direction.	Amount, (0-10), and Species.	No.	9 inches.	No.	12 inches.	No.	22 inches.						Temperature of Air, in feet. No.	Temperature and Direction of Wind. No.	9 A.M.	9 P.M.
		* 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.	No.	No.	No.
1	29.44 37	29.24 39.6	37 28.6	32 28	34.2 31.5	Still	S.																								Very fine A.M. B. P.M.	1				
2	28.75 40	29.51 40.5	37.4 30.5	35.5 33.6	33.7 30.7	Still	Still																								Shower showers A.M. Cloudy P.M.	2				
3	29.85 37.4	29.85 39	37.5 26.6	31 28	32 31	Still	N.																								Dull throughout	3				
4	30.00 40	29.97 40	39.8 30	37.4 33	36 32	Still	S																								Very fine A.M. Dull P.M.	4				
5	29.54 44	29.70 45	48 34.8	43.5 39.6	43.5 38.5	Still	Still																								P. with bright sun	5				
6	30.19 45	29.20 45.5	47 37	41.5 38.8	41 36.8	N.E.	S.E.																								Very fine	6				
7	29.97 42	29.87 45	45 34	36.7 34	40.7 38.2	S.E.	S.																								Dull A.M. Fine P.M.	7				
8	29.73 44.4	29.61 44	45.5 37	37.8 37	39 35	Still	Still																								Fine with passing clouds	8				
9	29.45 41.4	29.40 42	45 31	36.2 33.8	37.2 35	Still	Still																								Snow showers & dull A.M. Fine P.M.	9				
10	29.45 41	29.47 40.5	38 32	35.1 34.8	33.5 32.7	E	Still																								Snow showers showing squalls	10				
11	29.53 40	29.57 41	41.8 30.2	35.2 32.2	37.2 34.3	N.E.	N.																								Imp of snow. Showing with glimpses of sun	11				
12	29.63 38	29.60 39	36 30	32.5 29.3	33 29	N.E.	E.																								Passing clouds with squalls	12				
13	29.65 39	29.72 40.5	37.6 30	32.7 31	35 32	N.E.	N.E.																								Snow showers A.M. Cloudy P.M.	13				
14	29.85 39.7	29.85 43	41.4 30.7	35.5 32.2	37.8 34.9	N.E.	E																								Fine with passing clouds	14				
15	29.77 40	29.72 41	40.5 27.4	34.5 32.1	36 32	S.E.	S.E.																								Fine with passing clouds	15				
16	29.60 41.2	29.40 41.2	42 37.8	35 31.2	36 32.5	Still	S.E.																									Very fine	16			
17	29.30 41.7	29.50 44	41.8 29	36 32.8	40 37	S.E.	S.E.																									Dull throughout	17			
18	29.50 43	29.50 46.2	48 31.2	41.5 38.8	42.8 40	S	Still																									Showers A.M. Fine P.M.	18			
19	29.50 44	29.45 45.3	43 34.5	39.5 37	40.8 38.8	Still	Still																									Dull throughout	19			
20	29.52 43.4	29.67 46.1	38.4 34	42 38	44.5 36.8	Still	Still																									Very fine. Hail shower	20			
21	29.92 44.5	30.03 45	47 34.2	42 38	40 37	N.	N.																									Thunder A.M. Showers P.M.	21			
22	30.17 45.5	30.17 47	48.5 37	41.8 39	42.9 37.7	N.E.	N.E.																									Very fine	22			
23	30.25 44	30.22 49	57.5 32.2	42.1 39.5	47.5 45.3	Still	Still																									Fine but hazy	23			
24	30.20 47.5	30.15 48.2	47 39	44.2 41	44 41.2	N.E.	N.E.																									Dull A.M. Fine P.M.	24			
25	30.05 46	29.95 49.1	48 38	46 42	46 42	S.E.	S																									Dull throughout	25			
26	29.78 45.5	29.71 46.5	48.5 38	44.2 39.2	36.3 32.5	Still	N.E.																									Bright sun A.M. Cloudy P.M.	26			
27	29.77 44	29.60 45.1	43 29.2	35.5 32.1	37.7 34.6	Still	N.																									Cold and fine with passing clouds	27			
28	29.74 44.1	29.90 46.1	44.8 35.6	42.1 37.2	40.5 37.2	N.E.	N.E.																									Fine A.M. Showers P.M.	28			
29	30.02 44.5	30. 45	45 34.5	40.2 37	41 38.8	E.	N.E.																									Fine with passing clouds	29			
30	30.02 43.9	29.97 45	45.8 31.6	40 37	46.6 36.7	E.	N.E.																									Very fine	30			
31	29.70 40.7	29.84 47	51 27	40 36.2	46 40.7	Still	E																									Very fine	31			
Sums.		15.11 12.7			16.8 12.7		12.9 17																													
Means.		29.73 42.4			29.73 42.4		29.73 42.4																													
+ Total Corrections for Instrumental Errors.		29.73 42.4			29.73 42.4		29.73 42.4																													
+ Corrections for Diurnal Range.		29.73 42.4			29.73 42.4		29.73 42.4																													
"Corrected Means."		29.73 42.4			29.73 42.4		29.73 42.4																													
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction for Temp. (Col. 2), = 29.73 42.4  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = 29.73 42.4  
Mean at Station, corrected, and at 32°, = 29.73 42.4  
Correction for height, feet, above Mean Sea-level, = 1.209 91.0  
Mean, reduced to 32°, and Sea-level, = 29.73 42.4  
Highest Reading, corrected for Index error, on the 23 th, = 30.250  
Lowest Do., Do., on the 2 th, = 28.750  
Difference, or Monthly Range, = 1.500

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 23 th, = 51.5  
Lowest in Month, corrected for Index errors, on the 3 th, = 26.2  
Difference, or Monthly Range, = 25.3  
"Corrected Mean" of all the Highest, (Col. 5), = 44.0  
"Corrected Mean" of all the Lowest, (Col. 6), = 32.8  
Difference, or Mean Daily Range, = 11.2  
"Calculated Mean Temperature" of Month, = 38.6  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index errors), on the th, = 51.5  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 44.0  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = 26.2  
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = 32.8  
Difference of above Means or Range ("exposed"), = 11.2

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 38.9  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 25.8  
Computed Temperature of Dew-Point, = 31.7  
Do. Elastic Force of Vapour, = 1.78  
Do. Weight of Vapour in a Cubic Foot of Air, = 76  
Relative Humidity, (Saturation = 100), = 76  
RAIN fell on 8 Days; Amount in Inches, = 0.38

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

\* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S." and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.  
† Extracting 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 Hygrometric Tables, Second Edition only.  
¶ While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 5 and 6 will be entered as the "Calculated Mean Temperature."  
Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See page.

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

Observations made and  
Returned verified by

(Signed)

*Mr. Thomson*



WITH REMARKS ON THE USE OF INSTRUMENTS.

*Self Registering Thermometers*.—Professor Phillips's, and Negretti and Zambra's Patent "*Mariannum*." Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Mariannum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Mercurium*." This Thermometer is liable to two demerits, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it may be reunited by striking the instrument repeatedly against the palm of the hand; when the spirit distils by high temperature, it will be found in the upper 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.

*Snow-falls* 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 snow must be measured in some open place where no drift has accumulated, and registered in addition to, as a check upon, the observations, and registered in 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.

WITH REMARKS ON THE USE OF INSTRUMENTS.

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

[illegible]

SHRUBS, ETC.	FRUITS.	As First in Blossom.	Fruit Ripe, generally.
Barberry, . . . . .	Apple, . . . . .		
Boutee or Elder, . . . . .	Black Currant, . . . . .		
Bronze, . . . . .	Cherry, . . . . .		
Laurel, . . . . .	Grap, . . . . .		
Hawthorn, . . . . .	Gooseberry, . . . . .		
Holly, . . . . .	Teach, . . . . .		
Laburnum, . . . . .	Pear, . . . . .		
Lilac, . . . . .	Plum, . . . . .		
Mezerion, . . . . .	Strawberry, . . . . .		
Red Flowering Currant, . . . . .			
Rhododendron Ponticum, . . . . .			
Whin, . . . . .			
MOBILATORY PLANTS.			
Cuckoo, . . . . .			
Curlew, . . . . .			
House-Swallow, . . . . .			
Lapwing, . . . . .			
Plover, . . . . .			
Sand-Martin, . . . . .			
Starling, . . . . .			
Swan, . . . . .			
Rail or Corn Cuckoo, . . . . .			
DEPARTURES.			

Have the goodness 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; and the Agricultural condition of the district generally; and disease prevails among cattle; and whether Epizootic from blight, diseases, etc. Whether Epizootic

EDINBURGH.

BOOK-POST







WITH REMARKS ON THE USE OF INSTRUMENTS.

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no adjustment of the stem. 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 cotton, which also supplies it with water. It must be seen to by the observer that the menin is always *clean* and *moist*, and the water pure. In frosty weather exposure 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 to be thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of a Masou's  $\pi$  Hygrometer is highly objectionable.

When a Barometer having adjustable surfaces has been removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *sew* up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before unscrewing 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 *slap* *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 happens the instrument must be repaired.

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

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

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

column, an entry of ———, (*e.g.*) will indicate that the higher 2, cu-st.

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

*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.

By the use of abbreviations, the state of the weather at 9 A.M., between 9 and 9.30, and at 9.30 and 10 A.M., may be indicated in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that which is intended "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 *terni day* observations be taken; viz., on the 21st days of March, June, September, and Decem-

(By Order) A. B.

## OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.					
Alder,	.	.	.	.	.
Ash,	.	.	.	.	.
Beech,	.	.	.	.	.
Birch,	.	.	.	.	.
Elm,	.	.	.	.	.
Larch,	.	.	.	.	.
Lime,	.	.	.	.	.
Oak,	.	.	.	.	.
Sycamore or Plane,	.	.	.	.	.
In Flower,					
First buds first appear,					
In Leaf,					
Dressed or Leaves,					
CROPS, mentioning variety,	Barley,	.	.	.	.
	Bore or Bigger,	.	.	.	.
	Oats,	.	.	.	.
	Wheat,	.	.	.	.
	Beans,	.	.	.	.
	Peach,	.	.	.	.
	Potatoes,	.	.	.	.
	Turnips,	.	.	.	.
	Rye Grass,	.	.	.	.
Planting or above Ground,					
In Ear First Cut,					

SHRUBS, ETC.	Barberry, . . . . . Bourette or Elder, . . . . . Broom, . . . . . Hazel, . . . . . Hawthorn, . . . . . Holly, . . . . . Laburnum, . . . . . Lilac, . . . . . Myrica, . . . . . Red Flowering Currant, . . . . . Rhododendron Ponticum, . . . . . Viburnum, . . . . .
First in Blossom.	
FRUIT-TREES.	Apple, . . . . . Black Currant, . . . . . Cherry, . . . . . Grape, . . . . . Gooseberry, . . . . . Loquat, . . . . . Pear, . . . . . Plum, . . . . . Strawberry, . . . . .
First in Blossom.	
Fruit Ripens generally.	
First in Blossom.	
ALGAE, MARINE.	Cuckoo, . . . . . House-Swallow, . . . . . Lapwing, . . . . . Plover, . . . . . Sand-Martin, . . . . . Starling, . . . . . Sparrow, . . . . . Thrush, . . . . . Wren, . . . . .
First in Blossom.	
Departure.	

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

BOOK-POST.

*Secretary of the Meteorological Society of Scotland.*

EDINBURGH.

Death April 1809

Mr ALEXANDER BUCHAN

 $T_0$



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Dalkeith Gardens*, County of *Edinburgh*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *May* 18*69*.

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 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.												
		Barometre No. —	Attach- ed Ther- mometer	Barometre. No. —	Attach- ed Ther- mometer	Max. No. —	Min. No. —	Max. in Sun's rays No. —	Min. on Grass. No. —	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the F.C. Cup Anemometer No. —	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. 8 inches.	No. 12 inches.					No. 22 inches.			
		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.					inches.	inches.	inches.	
	1	30.05	50.5	29.90	62	40.5	32.5			51	45	64	52	S	2															Bright sunshine very mild	1			
	2	30.	51.5	30.	51	48	40.5			45	40	44	40	NE	E															Dull throughout slight shower 4.30 p.m.	2			
	3	29.90	50	29.83	50	48	38			43	40	43	39	E	E															Very Cloudy & dull throughout	3			
	4	29.90	49	29.95	51	48.5	38			44	37.5	45	39	E	E															Dull A.M. Blinks of sun P.M.	4			
	5	29.90	50	29.68	53	54	32			45.5	39.5	48	43	SE	SE															Blinks of sun A.M. dull P.M.	5			
	6	29.35	47	29.14	47	41	39.5			40.5	39.5	40.6	40.2	SE	SE															Rain throughout	6			
	7	29.05	47	29.23	47	44	39			42	41	41	39	E	ESE															Do	7			
	8	29.40	46.5	29.55	51	48	36.5			42	40	45	40	E	NE															Rainy with blinks of sun A.M. P.M.	8			
	9	29.65	48	29.48	52	51.5	29			45	40	46.5	42	SE	E															Cloudy with blinks of sun A.M. dull P.M.	9			
	10	29.38	49.5	29.35	50	46.5	39			43.5	42.5	46	45	NE	NE															Rain A.M. very dull P.M.	10			
	11	29.54	50	29.68	54	55	39			48	43	51	43	W	W															Cloudy with sunshine throughout	11			
	12	29.85	50.5	29.94	54	54	34.5			49	43	51	43	W	W															Do	12			
	13	30.15	50	30.20	56.5	54	35			49.5	41	53	45	W	SW																Bright sunshine very fine	13		
	14	30.20	52.5	30.15	56	59	43			53.5	45	55	44	NE	NE																Bright A.M. dull after part P.M.	14		
	15	30.	51.5	29.90	57	52.5	37.5			49.5	42.5	45	41	E	E																Blinks of sun A.M. dull P.M.	15		
	16	29.80	53	29.75	53	54	40			47	42	46	42	E	E																Do	16		
	17	29.58	50.5	29.50	53	50	41			45	42	46.5	43	E	E																Dull throughout	17		
	18	29.39	50	29.37	51.5	48	41			45	41	45	42	E	E																Do	18		
	19	29.40	51	29.40	55	54	40.5			47	42	53	46	ESE	NE																Cloudy with sunshine	19		
	20	29.40	51.5	29.43	55	55	40			47	43	50	48	NE	NE																	Slight shower A.M. Cloudy P.M.	20	
	21	29.65	53	29.70	55	59	45			48.5	46.5	50	47	NE	NE																	Rain till 8 p.m. dull A.M. Blinks of sun P.M.	21	
	22	29.80	55	29.90	56	57	41			51	47	50	46	NE	E																	Cloudy with sunshine slight shower A.M.	22	
	23	29.92	52	29.90	56	55	43			46	42	51	46	E	E																	Dull throughout slight sunshine P.M.	23	
	24	29.88	54	29.85	55	54	37			50	45	50	43	SE	E																	Dull with blinks of sun A.M. bright P.M.	24	
	25	29.60	52	29.75	52.5	51	33			48	43	48	44	E	E																	Dull throughout	25	
	26	29.70	52	29.74	51	50	43			48	43	44	41.5	E	E																	Do Rain at five P.M.	26	
	27	29.85	49.5	29.92	53	49	39			42	39	45	41	E	ESE																	Rain till 8 p.m. dull A.M. Blinks of sun P.M.	27	
	28	30.05	50	30.10	52	50.5	38			46	41	47	41	E	E																	Cloudy with sun high winds A.M.	28	
	29	30.10	51	30.05	55	58	30.5			50	43	52.5	48	NE	NE																	Bright sun A.M. dull with slight rain P.M.	29	
	30	29.95	54	29.88	55	55	44.5			51	46	49	47	W	W																	Dull A.M. Rain after part P.M.	30	
	31	30.	50	30.04	56	56	36			48	42	54	46	NE	NE			1.58														Cloudy with sunshine.	31	
Sums.		159	95			153	104			143	103																					NOTATION USED IN GENERAL REMARKS.		
		23.62	15720			16335	1055			2065	1440																					a. denotes aurora.		
Means.		29.762	50.7			52.7	9			46.7	42.2																					m. denotes meteor.		
† Total Corrections for Instrumental Errors.						-4				+5	+5	+5	+5																			ms. " meteors.		
† Corrections for Diurnal Range.						37.8				47.2	42.8																					n. " nimbus.		
" Corrected Means."																																r. " rain.		
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	h. r. " heavy rain.		
																																	c. h. r. " continued heavy rain.	
																																	s. " stratus.	
																																	sc. " squall.	
																																	st. " squalls.	
																																	t. " thunder.	
																																	ts. " thunder storm.	
																																	w. " wind.	
																																	g. " gale of wind.	

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction  $\dagger\dagger$  for Temp. (Col. 2), =  $29.704$   
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\dagger\dagger$  for Temp. (Col. 4), =  $29.704$   
Mean at Station, corrected, and at 32°, =  $29.704$   
Correction for height, feet, above Mean Sea-level, =  $209$   
Mean, reduced to 32°, and Sea-level, =  $29.913$   
Highest Reading, corrected for Index error, on the 14 th, =  $30.200$   
Lowest Do., Do., on the 7 th, =  $29.050$   
Difference, or Monthly Range, =  $1.150$

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 1 th, =  $70.5$   
Lowest in Month, corrected for Index errors, on the 9 th, =  $28.6$   
Difference, or Monthly Range, =  $41.9$   
"Corrected Mean" of all the Highest, (Col. 5), =  $50.7$   
"Corrected Mean" of all the Lowest, (Col. 6), =  $37.5$   
Difference, or Mean Daily Range, =  $13.2$   
\*\* Calculated Mean Temperature of Month, =  $45.1$   
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the th, =  $70.5$   
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  $50.7$   
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =  $28.6$   
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, =  $37.5$   
Difference of above Means or Range ("exposed"), =  $13.2$

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), =  $47.2$   
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), =  $42.7$   
†† Computed Temperature of Dew-Point, =  $37.57$   
†† Do. Elastic Force of Vapour, =  $0.2246$   
†† Do. Weight of Vapour in a Cubic Foot of Air, =  $70$   
†† Relative Humidity, (Saturation = 100), =  $70$   
RAIN fell on 12 Days; Amount in Inches, =  $1.580$

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	3	14	4	2	0	4	0	0		
P.M.	4	4	15	2	0	1	3	1	0		
Mean.	4	4	15	3	1	0	4	0	0		

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

Observations made and  
Return verified by

(Signed)



WITH REMARKS ON THE USE OF INSTRUMENTS.

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 contraction of the surface of mercury.

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

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

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

*Verification of Thermometers.*—No instrument ought to be used for Meteorological purposes till it has been carefully *tested* by comparison with a *Standard Thermometer*. When such Thermometers are not *Standard* Thermometers, then merely on an attached scale, undergo repairs they are very liable to be removed from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the *Minimum* Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once 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 bulls must *hump* *themselves* at least an inch from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by the inch, from any board on which it may be suspended; the water-cup must be covered, and linked to the side, and a little below the level of the web;—in no case under the bulls;—the muslin must be of medium fineness, and fastened at the neck of the bulb by a cotton thread, 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 soil in ordinary circumstances.

**Reading of the Thermometer:**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The readings ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read  $-39^{\circ}.9$ ,  $-40^{\circ}.0$ , or  $-40^{\circ}.1$ ; or, again,  $-40^{\circ}.4$ ,  $-40^{\circ}.5$ , or  $-40^{\circ}.6$ , according as it indicates a little under, an exact coincidence with, or a little over  $40^{\circ}$ , or  $40^{\circ}.5$ , respectively. So also  $-40^{\circ}.5$  and  $-40^{\circ}.7$ , more or less must be registered  $-40^{\circ}.2$  or  $-40^{\circ}.3$  and  $-40^{\circ}.7$  or  $-40^{\circ}.8$  respectively. In

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

by study the reasons, unsatisfactory.

*Rain-rangues*.—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 unexceptional position for the rain-gauge; but 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.

WITH REMARKS ON THE USE OF INSTRUMENTS.

as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity

column, an entry of  $\frac{1}{2}$ , ( $c_d$ ) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further observed to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

*Temperature of the Sea.*—Knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, 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 top 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.

*Ozone.*—Mention whether Schönböhm'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° E., as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as 3° on the scale, the 0 is from the N.W., and that its force on the scale 0—6 is 4°; i.e., that it is *blowing from*

*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 Green-

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 omitted, 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.

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

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

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

[illegible][illegible]

Whether Epidemic disease prevails among cattle; and the Agricultural condition of the district generally.

BOOK-POST

Mr ALEXANDER BUCHAN.

*Secretary of the Meteorological Society of Scotland.*

EDINBURGH.

Palpita  
May 1869

 $T_0$



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Edinburgh, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 7 feet.During the MONTH of June 1869.

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.				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.		P.M.		As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevailing Diseases, etc. Mention the hour at which Storms began and ended.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
		Baromete * No.	Atmos. inches.	Baromete. No.	Atmos. inches.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H. Co. 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, (11—15), and Species.	No. — 8 inches.	No. — 12 inches.	No. — 22 inches.	Temperature of WELL at Depth of feet. No.	Temperature at 1 foot, and Density.			0—10. 9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
		inches.	inches.	inches.	inches.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.			No.	No.	No.	No.		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

## NOTATION USED IN GENERAL REMARKS.

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

## TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction  $\ddagger$  for Temp. (Col. 2), = 29.848"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\ddagger$  for Temp. (Col. 4), = 29.848Mean at Station, corrected, and at 32°, = 29.848Correction for height, feet, above Mean Sea-level, = 209Mean, reduced to 32°, and Sea-level, = 30.057Highest Reading, corrected for Index error, on the 28th, = 30.250Lowest "Do," "Do," on the 15th, = 29.300Difference, or Monthly Range, = 0.950S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 26th, = 75.0Lowest in Month, corrected for Index Errors, on the 1st, = 37.1Difference, or Monthly Range, = 37.9"Corrected Mean" of all the Highest, (Col. 5), = 63.8"Corrected Mean" of all the Lowest, (Col. 6), = 45.7Difference, or Mean Daily Range, = 18.1\*\* Calculated Mean Temperature of Month, = 54.8S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the 1st, = 54.8"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 54.8Lowest at Night, Black Bulb, (corrected for Index errors), on the 1st, = 37.1"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = 37.1Difference of above Means or Range ("exposed"), = 17.7

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

Bulb, (Cols. 9 and 11), = 56.1

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

10 and 12), = 50.8†† Computed Temperature of Dew-Point, = 45.8†† Do. Elastic Force of Vapour, = 3.11†† Do. Weight of Vapour in a Cubic Foot of Air, = 69†† Relative Humidity, (Saturation = 100), = 69RAIN fell on 3 Days; Amount in Inches, = 1.41

WIND.		SUMMARY.				
Direction	N	NE	E	SE	S	SW
A.M.	2	3	8	2	1	10
P.M.	5	3	7	3	2	0
Mean.	4	3	7	2	2	1

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

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

Observations made and  
Return verified by

(Signed)

Mr. W. J. S. J.







## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Edinburgh, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of July 1869.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily at 9 P.M.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.				SEA.	OZONE.	GENERAL REMARKS.  As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevailing Diseases, etc.  Mention the hour at which Storms began and ended.	Days of Month.				
		9 h. A.M.		6 P.M.		Protected in Shade 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.		Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom, and Drift.	0 A.M. 9 P.M.									
		Baromete * No.	Attache d Ther mometer	Barometer. No.	Attache d Ther mometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc tion.	Force	Direc tion.	Force	No. of hours in which it fell.	Amount in inches. No.	Velocity, (0-6), and Direc tion.	Amount, (0-10), and Species.	Velocity, (0-6), and Direc tion.	Amount, (0-10), and Species.				No.					8 inches.	12 inches.	22 inches.	
	1	30.15	644	30.10	70.5	75.5	51.5			62	58	69.5	62.5	E																		Very Mild	1		
	2	30.10	65	30.4	68	72.5	50			62	58	66	62	E																		Do	2		
	3	30.08	62.8	30.5	65.5	65.5	49			57	55	57.5	54.8	E																		Very Mild	3		
	4	29.94	64.8	29.84	72.5	75	52			62	58	71	61	E																		Cloudy with blinks of sun fine	4		
	5	29.67	66.8	29.55	68	69.5	56			65	57	65	58.9	SW																		Do, though windy	5		
	6	29.50	65.8	29.70	65	64	56			60	57	59	50	SW																		Dull throughout	6		
	7	29.78	63	29.72	70	71	50			62	57	68	63	W																		Dull A.M. glimpses of sun High wind	7		
	8	29.64	67	29.61	69.8	69	60			65	60	65	59	SW																		Glimpses of sun Drizzle	8		
	9	29.78	64	29.93	67.2	65.5	50.8			59	57	61	53	W																		Glimpses of sun Drizzle	9		
	10	30.14	63.8	30.25	68	66	50			58	51.5	63	55	W																		Glimpses of sun High Wind	10		
	11	30.24	67	30.5	72	76	52			64	54	70	58	W																		Very Mild strong breeze	11		
	12	29.95	66.5	30.	66.5	66	54.5			59	55	60	51	W																		Cloudy with sun light wind	12		
	13	30.40	627	30.8	66	65	49			58.5	58.5	61.5	53	SW																		Do	13		
	14	30.10	63.8	30.3	68	65.5	51			58	55	61.5	54.5	W																		Dull throughout	14		
	15	30.50	66	30.5	72.4	74	53.5			63	59	69	63	W																			Very fine	15	
	16	30.50	69.8	30.7	74	76	58			69	62	71.8	62	W																			Do	16	
	17	30.40	66	29.45	73.5	77	51			64.2	59.5	71	64	W																			Very Mild	17	
	18	29.88	66	29.90	71.5	75	52.5			62	59	69	67	W																			Very fine though very Cloudy P.M.	18	
	19	30.50	61.5	30.7	67.2	67	53			55	52	62	57	E																			Dull A.M. Cloudy with sun P.M.	19	
	20	30.50	64.8	29.96	70.2	76	45			62	57	73	64	E																			Very Mild	20	
	21	29.90	69	29.82	76	81	52			70	62	76	64	SW																			Clear sunshine very fine	21	
	22	29.75	70	29.74	70	70	61			64	60	65	61	SW																			Dull throughout	22	
	23	29.81	68	29.85	71	71	55			62	56	65	58	SW																			Cloudy with sun light showers	23	
	24	29.83	67	29.80	70	70	53			62	57	67	58	W																			Cloudy with glimpses of sun	24	
	25	29.77	67	29.70	69	73.5	55			62	58	64.8	59	W																			Showering, Sun with passing clouds	25	
	26	29.55	65	29.58	68	70.8	53.5			61.5	58	62.5	57.5	S																			Do, with a few glimpses of sun	26	
	27	29.65	62	29.75	65	65.5	48.5			57	52	61	52.5	W																			Very Cloudy little sunshine	27	
	28	29.82	63	29.80	65	65	45.5			61	55	61	55	W																			Cloudy with showers little sun	28	
	29	29.72	63.5	29.50	62	67	44.5			62.5	55.5	56	53	S																			Dull throughout Rain in the evening	29	
	30	29.60	62	29.70	64	68	52			59	54	60	56.5	SW																				Glimpses of sun A.M. Dull P.M.	30
	31	29.65	64.5	29.67	64	68	57			60.5	57.5	58	54	SW																				Rain A.M. Sunny P.M. with rain at 5	31
	Sums.	1710	1510			144	114			122	162																								
	Means.	29.70	1612			2795	16275			190	2525																								
	Total Corrections for Instrumental Errors.	29.95	652			703	52.5			61.5	56.3																								
	Corrections for Diurnal Range.																																		
	"Corrected Means."					52.1				62.0	57.0																								
	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  $\pm$  = 29.860  
for Temp. (Col. 2), = 29.958 - 0.098 = 29.860  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\pm$  = 29.860  
for Temp. (Col. 4), = 29.958 - 0.098 = 29.860  
Mean at Station, corrected, and at 32°, = 29.860  
Correction for height, feet, above Mean Sea-level, = 0.209  
Mean, reduced to 32°, and Sea-level, = 30.0689  
Highest Reading, corrected for Index error, on the 15th, = 30.500  
Lowest Do., Do., on the 6th, = 29.500  
Difference, or Monthly Range, = 1.000

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 21th, = 81.0  
Lowest in Month, corrected for Index errors, on the 29th, = 44.1  
Difference, or Monthly Range, = 36.9  
"Corrected Mean" of all the Highest, (Col. 5), = 70.3  
"Corrected Mean" of all the Lowest, (Col. 6), = 52.1  
Difference, or Mean Daily Range, = 18.2  
\*\* Calculated Mean Temperature of Month, = 61.2

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 62.0  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 57.0  
† Computed Temperature of Dew-Point, = 52.9  
† Do. Elastic Force of Vapour, =         
† Do. Weight of Vapour in a Cubic Foot of Air, =         
† Relative Humidity, (Saturation = 100), = 72  
RAIN fell on 4 Days; Amount in Inches, = 0.30

WIND.	SUMMARY.										
	Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		1	2	4	0	2	5	16	1	0	
P.M.		1	2	0	5	0	3	11	8	1	0
Mean.		1	1	4	0	2	8	13	1	0	

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

Observations made and  
Return verified by

(Signed)

*Wm. Thomson*











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 incommensurable 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 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-sized Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes. An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-tube* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-lens* 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 *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 uppermost. Before suspending the Barometer for use, the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp 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 adjusted carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index; usually the lower edge of the vernier which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

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

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

The above remarks apply equally to the Thermometers for

registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides prevent 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 discolouring.

**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 derivations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*; and the water pure. In frosty weather observation is a matter of much delicacy; and must be made with great care. The bulb must be immersed in water from 15 to 30 minutes before the four readings are taken.

One form of *Rutherford'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  $-39^{\circ}.3$ ,  $40^{\circ}.0$ , or  $40^{\circ}.1$ ; or again,  $40^{\circ}.4$ ,  $40^{\circ}.5$ , or  $40^{\circ}.6$ , according as it indicates a *fourth*, *half*, or an exact coincidence with, or a little over  $40^{\circ}$ , or  $40^{\circ}.5$ , respectively. So also  $40^{\circ}.2$ , and  $40^{\circ}.3$ , more or less must be registered. *Rutherford's* "*Max.*" and "*Min.*" Thermometers, the reading of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

**Hour of observing Temperature.**—The Hygrometer is read at 9 a.m. and 9 p.m. The self-registering Thermometers are read at 9 p.m. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrences to their proper meteorological *day*. In the Society's schedules the indications registered at 9 p.m. on the *2nd*, and extending till 9 p.m. on the *3rd*, 9 p.m. on the *2nd*, and extending till 9 p.m. on the *3rd*, are those of a series of phenomena occurring at 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, the direction of the lower strata of clouds overhead, and to the direction of smoke, etc. Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

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

**Rain-gauges.**—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an 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.

**Snow-falls may, for convenience,** be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indicated in every column, the observer cannot be too careful to register *observations* only; and rolling that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's

BOOK-POST.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	First Leaves.	In Leaf.	Divested of Leaves.	CROPS mentioning variety.	Sowing or Ploughing.	Reaping or Above Ground.	In Flower.	First or Second.
Alder.					Barley.				
Ashy.					Bare or Blight.				
Beech.					Oats.				
Birch.					Wheat.				
Elm.					Beans.				
Larch.					Potatoes.				
Lime.					Turnips.				
Oak.					Rye Grass.				
Sycamore or Plane.									

SHRUBS, &c.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.
Barberry.									
Bourtree or Elder.									
Broom.									
Hazel.									
Hawthorn.									
Holly.									
Laburnum.									
Lilac.									
Mezerion.									
Mountain Ash or Hovan.									
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, &c., whether plentiful or in perfection; whether any have suffered from Blight, disease, etc. Whether Hops, Potatoes, disease prevails among cattle; and the Agricultural condition of the district generally.

Edinburgh  
October 1869

To

Mr. ALEXANDER RUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Dalkeith Gardens*, County of *Edinburgh*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *September* 18*69*.

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. Temperature at 1 fathom and Depth.	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 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.										
		Baromet.	Attach- ed Ther- mometer	Baromet.	Attach- ed Ther- mometer	Max.	Min.	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Dirac- tion.	Force	Dirac- tion.	Force	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	No. 3 inches.	No. 12 inches.		No. 22 inches.							
		* No.		No.		No.	No.	No.	No.																							
		inches.	°	inches.	°	°	°	°	°	°	°	°	°	°									°		°	°						
	1	30.35	56.2	30.34	60.5	66	42			54	49	60	53	N	2	N														Cloudy with sunshine	1	
	2	30.30	57.5	30.23	59	61.5	44.5			55	49	55	51	N	2	E														Dull throughout	2	
	3	30.03	59	29.87	62	66.5	45			60	53	60	54.5	S	3.5	SSE														Cloudy with glimpses of sun & dull P.M.	3	
	4	29.85	59.8	29.77	61.5	66	47.5			57.5	52.5	58	52	S	3.5	SE														Cloudy with sunshine	4	
	5	29.63	60	29.55	67	69	48			57.5	55	65	62.9	SSE	3.5	SSE														Overcast with glimpses of sun slight showers P.M.	5	
	6	29.51	62	29.50	63	65.5	49.5			60.5	57	61	55	SSE	3.5	N														Overcast throughout	6	
	7	29.58	62	29.50	62	64	51			59	54	57	54	N	3.5	SSE															Very Cloudy & dull & slight showers P.M.	7
	8	29.43	65	29.50	62.5	64	55			64	58	57	55	SSE	3.5	SSE															Cloudy with showers	8
	9	29.53	61.5	29.53	64	69	50			62.5	53.5	62	53.5	SSE	3.5	SSE															Cloudy with sunshine	9
	10	29.24	64.5	29.05	63	69	56			64	58	57	56	SSE	3.5	SE															Dull & little sun P.M. heavy rain at night	10
	11	29.12	59	29.17	60	61	51			55	51	56	50.5	N	3.5	SSE															Cloudy with sunshine	11
	12	29.00	55.5	29.16	54.4	51	48			50	49.8	48.5	47.2	N	3.5	N															Very heavy rain throughout	12
	13	28.92	53	29.25	58	62	59.8			48	47.5	58	57.5	SSE	3.5	N															Showerly & dull cloudy with sunshine P.M.	13
	14	29.45	57	29.25	59	62	50			55	51	56.5	53	SSE	3.5	N															Do & in heavy shower P.M.	14
	15	29.14	57	29.10	58.8	59	49			57	53	54	51	SSE	3.5	SSE															Unsettled appearance & in shower P.M.	15
	16	29.28	56	29.50	58	62	46.5			56	51	55	49	N	3.5	N															Cloudy with sunshine	16
	17	29.46	55.5	29.30	60.5	65	46.5			57	49	60	56	SSE	3.5	SSE															Dull & little sun & very Cloudy P.M.	17
	18	29.12	60	28.95	61	63.5	53			59	56	58	54	SSE	3.5	SSE															Cloudy with sun Gale of Wind	18
	19	28.98	56	28.74	56	53	43			58	44	49	46	SSE	3.5	N															Glimpses of sun & in Rain P.M. Pacific Gale	19
	20	29.17	55	29.26	56	58.5	46.5			52	48	58.5	45	N	3.5	N															Cloudy with sunshine	20
	21	29.36	53	29.53	52.5	55	45			50	46	48.8	45	N	3.5	N															Cloudy & unsettled heavy shower at noon	21
	22	29.80	53	29.65	55	53.5	42			52	48	55	53	N	3.5	SSE															Dull & in Rain P.M.	22
	23	29.76	57.5	29.81	59	61	52.5			55	53.5	56	55	SSE	3.5	N															Rain & in Dull P.M.	23
	24	29.76	60.5	29.66	61	62	53			60	57.8	57.5	57	SSE	3.5	N															Dull with Rain from 5 P.M.	24
	25	29.55	62.5	29.30	61.2	64.5	57			62	55	57	54	SSE	3.5	SSE															Cloudy with sun & in shower P.M. unequal	25
	26	29.40	59	29.65	57.5	57.7	51			53.5	50	51.2	47.8	N	3.5	N															Line with very strong wind	26
	27	29.76	53.5	29.70	53.3	53.5	43.5			50	47	49	48	N	3.5	SSE															Dull throughout slight shower till 2 P.M.	27
	28	29.44	54.2	29.30	53.2	54	46			57	49	52	51	SSE	3.5	SE															Rain throughout	28
	29	29.40	57.5	29.50	60.5	64	53.5			61	53.8	58.5	56	S	3.5	S															Cloudy with sunshine & in Dull P.M.	29
	30	29.65	57	29.64	57	55	52			54.9	54.7	53	52.8	E	3.5	SE			3.68												Rain throughout & foggy	30
	31																															
Sums.		1311	245	149	123	5	144	26	16	71	63	165	171	37	134																	NOTATION USED IN GENERAL REMARKS.
		1.487	17.4	14.16	17.80	4	17.7	14.64	3	17.62	15.81	18.55	15.17																			a. denotes aurora.
		14.87	17.4																													m. denotes meteor.
																																ci. cirrus.
																																ci. cu. cirro-cumulus.
																																ci. s. cirro stratus.
																																cu. cumulus.
																																cu. s. cumulo-stratus.
																																dw. dew.
																																f. fog.
																																fr. frost.
																																h. fr. hoar-frost.
																																h. haze.
																																h. d. heavy dew.
																																h. hall.
																																l. lightning.
																																li. cl. light clouds.
																																li. sh. light showers.
																																lu. co. lunar corona.
																																lu. ha. lunar halo.

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction  $\pm$  = *29.418*  
for Temp. (Col. 2), = *29.426* — *0.008*.“Corrected Mean” of Barometer at 9 P.M., minus the Correction  $\pm$  = *29.391*  
for Temp. (Col. 4), = *29.412* — *0.021*.Mean at Station, corrected, and at 32°, = *29.404*Correction for height, feet, above Mean Sea-level, = *0.209*Mean, reduced to 32°, and Sea-level, = *29.613*Highest Reading, corrected for Index error, on the 1 th, = *30.350*Lowest Do., Do., on the 19 th, = *28.740*Difference, or Monthly Range, = *1.610*S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 5 th, = *69.0*Lowest in Month, corrected for Index errors, on the 13 th, = *39.4*Difference, or Monthly Range, = *29.6*“Corrected Mean” of all the Highest, (Col. 5), = *61.4* = *58.7*“Corrected Mean” of all the Lowest, (Col. 6), = *48.4* = *47.7*Difference, or Mean Daily Range, = *13.0* = *10.8*\*\* Calculated Mean Temperature of Month, = *54.9* = *53.0*

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

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

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

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

Difference of above Means or Range (“exposed”), =

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

Bulb, (Cols. 9 and 11), = *56.4*

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

10 and 12), = *52.6*†† Computed Temperature of Dew-Point, = *49.1*†† Do. Elastic Force of Vapour, = *350*

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

†† Relative Humidity, (Saturation = 100), = *77*RAIN fell on 16 Days; Amount in Inches, = *3.68*

WIND.	SUMMARY.									
	Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
A.M.		1	0	1	0	4	12	10	2	0
P.M.		2	1	1	3	4	6	12	1	0
Mean.		2	0	1	1	4	9	11	2	0

\* Each instrument tested at the Office in Edinburgh bears the stamp “S.M.S.” and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.  
† Embarassing 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 Hygrometric Tables, Second Edition only.  
\*\*\* While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 5 and 6 will be entered as the “Calculated Mean Temperature.”  
Any Observations not taken under the conditions specified by 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 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by

(Signed)



WITH REMARKS ON THE USE OF INSTRUMENTS.

*Hour of Observation.*—The Council recommended that Observations be made precisely at 9 o'clock (Greenwich or Railway Time) 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, if 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*.

the mercury can be adjusted to the zero-point of the fixed scale by turning the ivory nut, so that the level of the mercury and their coincidence being indicated by a little ivory dot, whose position passes freely through the lid and case of the cistern. When the piston-rod 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.

In *taking an Observation*, the attached Thermometer is first noted: the tube must then be gently tapped and the eastern adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the vernier—usually the lower edge of the vernier, 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 black within, and fixed 4 feet above grass in an exposed position, free from any merely local influences. The laths forming the sides and doors of the Boxes are arranged so as to once "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 ordered at the Society's Office.

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

The above remarks apply equally to the Thermometers for

WITH REMARKS ON THE USE OF INSTRUMENTS.

Observations<sup>1</sup> of the clouds are made at 9 A.M. and an upper level is chosen as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction,"  $2\frac{1}{2} W$  (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{1}{2}$  (e.g.) will indicate that the higher

*Temperature of the Sea*.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of the atmosphere, 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 "poor and rocks round" or the coast, where it is not influenced by the temperature of river water. At or near the time of high water, on the 15th, 15th, and 25th of each month, the thermometer ought to be suspended exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations may be taken at other depths, and at other times. The temperature of the air, and the hour of observation; and continuing to observe for particular depths.

*Electricity*.—Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper element 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 under the above is to be taken very cognate.

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 in one, and the observations should be made up, so that the space required is unoccupied, or in two ruled off for the purpose, from that needed "unrecorded." It is intended that observations by the aneroid barometer 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 considerable interest to the Agricultural. The Council would direct the special attention of Observers to the registration of such phenomenon; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year in a selected piece of ground or farm.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

SHRUBS, ETC.		FRUITS.		MIGRATORY BIRDS.	
First in Blossom.	Apple.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.
Barberry.	Black Currant.	Cherry.	Gooseberry.	House-Swallow.	Cuckoo.
Broom.	Gean.	Lapwing.	Holly.	Curlew.	Starling.
Bouree or Elder.	Plum.	Swallow.	Laburnum.	Swan.	Swan.
Mountain Ash or Rowan.	Rasp.	Robin.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.
Rhododendron Ponticum.	Strawberry.	Robin.	Strawberry.	Strawberry.	Strawberry.
Whin.		Robin.			

Have the goodness also to state any information you may have to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Prunes, etc., whether plentiful, or in perfection; whether any have suffered from blight, diseases, etc. Whether Lepizote, diseases prevail among cattle; and the Agricultural condition of the district generally.

BOOK-POST.

EDINBURGH.

*Secretary of the Meteorological Society of Scotland*

Mr. ALEXANDER BUCHAN

*To*

W  
Dallwitz  
Sept 809



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens County of Edinburgh, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of October 1869.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.				SEA.	OZONE.	GENERAL REMARKS.	Days of Month.			
		0 h. A.M.		0 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		0 h. A.M.		0 h. P.M.		0 h. A.M.		0 h. P.M.		Readings of the H-Gap Anemometer.		0 h. A.M.		0 h. P.M.		0 h. A.M.		0 h. P.M.								
		Baromet.	Attach- ed Ther- mometer	Baromet.	Attach- ed Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	No. 8 inches.	No. 12 inches.	No. 22 inches.								
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.					No.		
		inches.	°	inches.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°					°		
	1	29.56	58	29.61	57.2	57.8	50.8			55.2	55	52.3	52	SE	SSW													Morning foggy Rain throughout	1					
	2	29.69	57	29.73	59	62	49			54	52.2	55	53.7	SE	SE													Very Cloudy little sunshine	2					
	3	29.86	56	29.94	57.2	59	46.5			53	52.4	52.5	51	E	E													Cloudy with sunshine fine	3					
	4	30.03	54	30.01	51.1	63	48			52	50	53	51	SE	SE														Bright sunshine very fine	4				
	5	30.00	53.8	30.04	57.8	58.5	45			53.5	50.5	54.5	53.5	S	E														Line in the morning till 11 AM	5				
	6	30.08	53.8	30.07	57.8	64	45			57.2	54.6	53.5	52.5	SE	SE														Do. Do.	6				
	7	30.0	53.5	29.99	54	61	47.8			53	50.2	56	53	SE	SE															Dull throughout	7			
	8	29.89	59	29.96	61	64	52			57.3	55	58	56	SE	SE															Cloudy with sun in P.M.	8			
	9	30.05	60.3	30.05	62	66	52			58.2	57	58.5	57.2	E	E															Very fine	9			
	10	29.96	58.2	29.98	63	68	46.5			59.5	57.5	62.5	60	SE	SE															Very mild & hazy	10			
	11	29.90	62.7	29.98	62	63	57.5			62	59	59	57	SE	SE																Dull throughout	11		
	12	29.84	61.2	29.78	61.2	65.8	56			59.8	57	57	53.5	SE	SE																Dull in P.M. Cloudy with sun in P.M.	12		
	13	29.76	63.3	29.76	50	50	43			46	41	43	40	E	E																Rain & hail showers at noon Cloudy	13		
	14	29.87	49	29.74	50	48.8	39			44	40	46.5	45.2	E	E																Dull throughout	14		
	15	29.44	50	29.27	52	51	43			46	46.5	49.5	48.5	SE	E																Rain nearly throughout no sunshine	15		
	16	29.02	50	29.18	48.9	48	41.8			46.5	42	41	38.2	E	SE																Shower of rain from 4.30 to 5.30	16		
	17	29.54	46	29.58	46.2	42.5	32			36.4	35	40.2	37	E	E																Dull in P.M. Cloudy in P.M.	17		
	18	29.20	46.8	29.30	47.1	46.5	37.8			43	41.2	42	41.5	SE	SE																	Dull throughout Rain at night	18	
	19	29.70	45	29.86	40.8	40	32.5			36	35	34	30.5	E	E																	Cloudy with sun Gale of wind	19	
	20	29.82	44.2	29.80	49.5	52	30			43	41.5	50	47	E	E																	Overcast with glimpses of sun	20	
	21	30.10	48	30.20	48	57.8	34.8			48	42	44.2	43	E	SE																	Cloudy with sunshine fine	21	
	22	30.28	49.8	30.17	57	62	42.8			48.8	45	49	46	SE	E																	Dull throughout	22	
	23	30.00	54.9	29.93	53.5	57.5	47.2			54.4	52.3	57	52	E	E																	Do. Do.	23	
	24	30.05	49	30.10	50	52.5	41.6			47	42.6	45.7	42.7	SE	E																	Very fine	24	
	25	30.02	44.3	29.64	50	50.2	33.4			39.8	37.5	49.5	47.2	E	E																	Dull throughout	25	
	26	29.82	44.9	29.84	43	41	35			38.5	33.2	34.5	32.5	SE	SE																		Cloudy with sun high wind	26
	27	29.72	42.8	29.78	39.2	38	29.8			33.5	30.5	33	32	SE	SE																		Glimpses of sun Cloudy	27
	28	29.79	41	29.64	41.5	40.5	31			38	32.4	36	33	E	E																	Do. Do.	28	
	29	30.14	39	30.05	44	43.5	30			34	32	40.7	40	SE	E																		Dull throughout Rain at night	29
	30	29.98	49	30.00	49	49	39.8			46.5	46	46	45	SE	E																		Drizzling rain throughout	30
	31	30.00	57	30.00	49.2	52	44.5			52	49	46	45	E	E																		Cloudy little sunshine	31
Sums.		6 14 11	15 6	16 12	14 5	12 6	49			17 1	11 6	14 6	11 5																					
Means.		29.55	55.8	29.68	56.1	56.1	43.0			48.1	45.6	48.7	46.2																					
Total Corrections for Instrumental Errors.																																		
Total Corrections for Diurnal Range.																																		
Corrected Means.																																		
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			

BAROMETER, "corrected Mean" at 9 A.M. 29.55 the Correction ++ for Temp. (Col. 2), = 0.00 = 29.55

"Corrected Mean" of Barometer at 9 P.M. 29.68 minus the Correction ++ for Temp. (Col. 4), = 0.03 = 29.71

Mean at Station, corrected, and at 32°, = 29.798 780

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

Mean, reduced to 32°, and Sea-level, = 29.989

Highest Reading, corrected for Index error, on the 22th, = 30.250

Lowest Do., Do., on the 16th, = 29.020

Difference, or Monthly Range, = 1.230

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 10th, = 68.0

Lowest in Month, corrected for Index errors, on the 27th, = 29.4

Difference, or Monthly Range, = 38.6

"Corrected Mean" of all the Highest, (Col. 5), = 53.5 = 53.8

"Corrected Mean" of all the Lowest, (Col. 6), = 41.5 = 41.8

Difference, or Mean Daily Range, = 12.0 = 12.3

\*\* Calculated Mean Temperature of Month, = 47.5 = 47.8

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the 11th, = 68.0

"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 68.0

Lowest at Night, Black Bulb, (corrected for Index errors), on the 11th, = 41.5

"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = 41.5

Difference of above Means or Range ("exposed"), = 26.5

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 48.0 = 47.4

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 46.4 = 46.1

Computed Temperature of Dew-Point, = 44.5 = 44.7

Do. Elastic Force of Vapour, = 295.295

Do. Weight of Vapour in a Cubic Foot of Air, = 89 = 91

Relative Humidity, (Saturation = 100), = 89 = 91

RAIN fell on 7 Days; Amount in Inches, = 1.80

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day.
	Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.		
A.M.		4	2	2	0	4	5	10	4	0		
P.M.		9	0	0	3	2	13	4	0			
Mean.		6	1	1	0	4	3	12	4	0		

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

Observations made and  
Return verified by

(Signed)















# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens County of Edinburgh, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 3 miles.

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

During the MONTH of December 1869.

The Hours of Observation are of Greenwich Time.

**BAROMETER,** "corrected Mean" at 9 A.M., *minus* the Correction ++ }  
for Temp. (Col. 2), = 29.572 ... - 0.30 } = 29.492

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

**Mean at Station, corrected, and at 32°,** ..... = 29.492

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

**Mean, reduced to 32°, and Sea-level,** ..... = 29.699 701

Highest Reading, corrected for Index error, on the 8 th, ..... = 30.450

Lowest    Do.,                      Do.,                      on the 13 th, ..... = 28.350

Difference, or **Monthly Range,** ..... = 12.00 2100

**S.-R. THERMOMETER,** (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 18<sup>th</sup>, ..... = 53.2 = 50.5

**Lowest in Month,** corrected for Index errors, on the 28<sup>th</sup>, ..... = 16.1 = 16.4

Difference, or **Monthly Range,** ..... = 37.1 = 34.1

" Corrected **Mean** " of all the **Highest,** (Col. 5), ..... = 39.9

" Corrected **Mean** " of all the **Lowest,** (Col. 6), ..... = 30.2

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

**\*\* Calculated Mean Temperature** of Month, ..... = 35.0

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

<b>HYGROMETER, Mean</b> (corrected) A.M. and P.M. Reading of <b>Dry Bulb</b> , (Cols. 9 and 11),		=	<del>82.1</del> 35.9
<b>Mean</b> (corrected) A.M. and P.M. Reading of <b>Wet Bulb</b> , (Cols. 10 and 12),		=	<del>36.4</del>
‡ Computed <b>Temperature of Dew-Point</b> ,		=	<del>33.4</del> 34.8
‡ Do. <b>Elastic Force of Vapour</b> ,		=	<del>193</del> 202
‡ Do. <b>Weight of Vapour in a Cubic Foot of Air</b> ,		=	
‡ <b>Relative Humidity</b> , (Saturation = 100),		=	<del>81</del> 93
<b>RAIN</b> fell on	<b>Days; Amount in Inches,</b>	=	1.55

WIND.	SUMMARY.										
Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day
A.M.	0	2	5	0	0	4	9	3	0		
P.M.	0	2	0	4	0	10	8	7	0		
Mean.	1	2	2	2	0	11	8	5	0		

Each instrument tested at the Office at Edinburgh bears the stamp "S.T.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.

Emerging corrections for both capillarity and Index Errors.

The Diurnal Range for Scotland is as yet unknown.

*Practically*, though not *absolutely* a *minus* correction.

These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only*.

While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 5 and 6 will be entered as the "Calculated Mean Temperature."

And the "Remarks" will contain the Corrections from the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. *See over.*

Observations made and  
Return verified by

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

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

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

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

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

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

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

The above remarks apply equally to the Thermometers for

registering the greatest heat from the sun's rays, and the least amount of cloud in the atmosphere, ought to be estimated from the greater or less obscuration of the sky overhead (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the "*clouds*" column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of clouds 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. "*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. will indicate that the (*extreme*) speed of the former is 2 ft. Again, in the second "*Clouds*" column, an entry of 2, east, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4 tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2 tenths by lower clouds of the *cumulo-stratus* kind.

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

**Underground Thermometers.**—As the ground, for soil 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 with Schönbien's or Morf'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 2°; as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "2°" on the scale, that the wind is from the N.W.; and that its force on the scale 0—6 is "4"; i.e., that it is *blowing fresh*.

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

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

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

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

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

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

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

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

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

(By Order)

A. B.

EXAMINER, 24th December, 1856.

Convenient Abbreviations for Luke Howard's

## OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	IN LEAF.	DEEPEST OF	CROPS.	PLANTING.	SOOTHING OF	IN BAR.	IN LEAF.	IN BAR.	IN LEAF.	IN BAR.
Alder.			Barley.							
Aspen.			Beech.							
Birch.			Oats.							
Elm.			Wheat.							
Larch.			Beans.							
Maple.			Peas.							
Pine.			Potatoes.							
Rose.			Rye Grass.							

SHRUBS, ETC.	IN BLOSSOM.	FRUIT.	FRUIT IN BLOSSOM.	FRUIT IN BLOSSOM.	FRUIT IN BLOSSOM.	FRUIT IN BLOSSOM.	FRUIT IN BLOSSOM.	FRUIT IN BLOSSOM.	FRUIT IN BLOSSOM.	FRUIT IN BLOSSOM.
Apple.			Black Currant.							
Berry.			Cherry.							
Bramble.			Gooseberry.							
Burnthorn.			Hawthorn.							
Crab.			Holly.							
Craneberry.			Laburnum.							
Craneberry.			Lilac.							
Craneberry.			Mountain Ash or Rowan.							
Craneberry.			Red Flowering Currant.							
Craneberry.			Rhododendron.							
Craneberry.			Whin.							

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

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

Mr. ALEXANDER BUCHAN,

To

Perth  
Dec 1859