

## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Mid Lothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of January 1864.

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.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.		Amount in inches.		9 A.M.		P.M.		9 h. A.M.		No. 12.		No. 22.		Temperature of WELL at Depth of feet. No.		Temperature at 1 fathom and Density.		0-10.		As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		Barometer.		Barometer.		Max.		Min.		Dry bulb.		Wet bulb.		Direction.		Force.		No.		No.		Velocity (0-10).		Amount (0-10).		Velocity (0-10).		Amount (0-10).		No.		No.		No.		No.		Mention the hour at which Storms began and ended.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction ++ = 29.872  
for Temp. (Col. 2), = 29.872 - 0.38 = 29.492  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ = 29.872  
for Temp. (Col. 4), = 29.872 - 0.38 = 29.492  
Mean at Station, corrected, and at 32°, = 29.872  
Correction for Height, feet, above Mean Sea-level, = 209  
Mean, reduced to 32°, and Sea-level, = 30.081  
Highest Reading, corrected for Index error, on the 4th, = 30.410  
Lowest Do., Do., on the 22th, = 29.170  
Difference, or Monthly Range, = 1.240

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 28th, = 57.5  
Lowest in Month, corrected for Index errors, on the 5th, = 13.0  
Difference, or Monthly Range, = 38.5  
"Corrected Mean" of all the Highest, (Col. 5), = 41.5  
"Corrected Mean" of all the Lowest, (Col. 6), = 29.8  
Difference, or Mean Daily Range, = 11.7  
\*\* Calculated Mean Temperature of Month, = 35.6

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the th, = 57.5  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 57.5  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = 13.0  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = 13.0  
Difference of above Means or Range ("exposed"), = 44.5

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 351  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 335  
\*\* Computed Temperature of Dew-point, = 31.0  
\*\* Do. Elastic Force of Vapour, = 173  
\*\* Do. Weight of Vapour in a Cubic Foot of Air, = 84  
\*\* Relative Humidity, (Saturation = 100), = 84  
RAIN fell on Days; Amount in Inches, = 0.96

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	0	0	3	14	8	4	2	0		
P.M.	0	1	0	3	15	7	4	1	0		
Mean.	0	0	0	3	14	7	4	2	0		











INSTRUCTIONS

FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

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

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

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

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

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be served so as to form a tight plug to the cistern. Then *scrape* 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 by 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 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 nearly local influences. The lids forming the sides and doors of the Boxes are arranged so as to open 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 Zamboni's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rathenford 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 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 pole, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate, and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal: the bulb end should incline slightly downwards, rather than the other.

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

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

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the *apparent and corrected form* of the observations seriously vitiate the "*Hygrometric*" 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 to the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

**Reading of the Thermometer.**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.9, 40.0, or 40.1; or again 40.4, 40.5, or 40.6, according as it indicates a little under an exact coincidence with, or a little over 40°; or 40.3, respectively. So also 40.4, and 40.8, more or less, must be registered. Rathenford's "*Min.*" and "*Max.*" Thermometers, in indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

**Wind.**—A wind-vane ought to be elevated 12 feet at least, above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, 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 *Registering* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

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

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

(*Clouds.*—Convenient abbreviations for Luke Howard's

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

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

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

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

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

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

**Ozone.**—Mention whether Schönbach's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation in the following manner:—thus 3  $\frac{1}{2}$ , as an ozone entry in the schedule, will indicate that the ozone paper is tinted 3  $\frac{1}{2}$  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 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 contrivances ought, therefore, to be taken every advantage of, and of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

(By Order,) A. B.

Edinburgh, 9th December, 1864.

BOOK-POST.

EDINBURGH.

10, St Andrew Square,

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN,

To

Edinburgh  
February 1864

SHRUBS, ETC.		FRUITS		MIGRATORY BIRDS.		Other Birds, naming them	
First in Blossom.	First in Leaf.	First in Blossom.	First in Leaf.	First in Blossom.	First in Leaf.	First in Blossom.	First in Leaf.
Barberry.....	In	Apple.....	In	Cuckoo.....	In	Swallow.....	In
Bourne or Elder.....	In	Black Currant.....	In	Cartew.....	In	Starling.....	In
Broom.....	In	Cherry.....	In	House-Swallow.....	In	Peewee.....	In
Holly.....	In	Gooseberry.....	In	Lapwing.....	In	Robin.....	In
Laburnum.....	In	Gum.....	In	Plover.....	In	Sand-Martin.....	In
Lilac.....	In	Hawthorn.....	In	Swallow.....	In	Swallow.....	In
Mountain Ash or Rowan.....	In	Strawberry.....	In	Swallow.....	In	Swallow.....	In
Rod Flowering Currant.....	In	.....	In	.....	In	.....	In
Whin.....	In	.....	In	.....	In	.....	In

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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



# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Mid Lothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea 8 miles.

Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet. During the MONTH of March 1864.  
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.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.		under Ground.		Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom, and Density.						0-10.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		Barometer. No.	Attached Thermometer.	Barometer. No.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.			Direction.	Force.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	No.	3 inches.					12 inches.	22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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**BAROMETER**, "corrected Mean" at 9 A.M., minus the Correction for Temp. (Col. 2), = 29.479  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = 29.479  
**Mean at Station, corrected, and at 32°**, = 29.479  
Correction for Height, feet, above Mean Sea-level, = 209  
**Mean, reduced to 32°, and Sea-level**, = 29.688  
Highest Reading, corrected for Index error, on the 16 th, = 29.910  
Lowest Do., Do., on the 7 th, = 28.790  
Difference, or **Monthly Range**, = 1.120

**S.-R. THERMOMETER**, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 31 th, = 55.0  
**Lowest in Month**, corrected for Index errors, on the 10 th, = 18.0  
Difference, or **Monthly Range**, = 37.0  
"Corrected Mean" of all the **Highest**, (Col. 5), = 45.0  
"Corrected Mean" of all the **Lowest**, (Col. 6), = 30.2  
Difference, or **Mean Daily Range**, = 14.8  
\*\* Calculated **Mean Temperature** of Month, = 37.6

**S.-R. THERMOMETER, Black Bulb, in Sun, Highest**, (corrected for Index Errors), on the    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**, = 38.5  
**Mean** (corrected) A.M. and P.M. Reading of **Wet Bulb**, = 36.2  
\*\* Computed **Temperature of Dew-point**, = 32.2  
\*\* Do. **Elastic Force of Vapour**, = 189  
\*\* Do. **Weight of Vapour in a Cubic Foot of Air**, =     
\*\* **Relative Humidity**, (Saturation = 100), = 82

RAIN fell on    Days; Amount in Inches, = 2.00

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

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh no later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

(Signed) James Watson

P



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 to 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 it is therefore hoped, that those persons who kindly furnish Reports to the Society will, by a careful 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 modernized-species Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

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

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

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

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

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

## OBSERVATIONS,

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 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  $\frac{1}{2}$ , cu-st., (*cu*st.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

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

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

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

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

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

**Remarks.**—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 occurrences of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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

(By Order.) A. B.

EDINBURGH, 30 December 1866.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	GRASSES.	MEADOWS.	WOODS.	WETLANDS.	SWAMPY.	WETLANDS.	SWAMPY.	WETLANDS.	SWAMPY.
Alder, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....
Aspen, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....
Beech, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....
Birch, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....
Elm, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....
Larch, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....
Oak, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....
Sycamore or Plane, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....	Bale, .....

SHRUBS, ETC.	FRUITS.	First in Season.	First in Season.	First in Season.	First in Season.	First in Season.	First in Season.	First in Season.	First in Season.
Barberry, .....	Apple, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Hawthorn, .....	Holly, .....	Laburnum, .....	Lilac, .....	Mountain Ash or Rowan, .....
Red Flowering Currant, .....	Strawberry, .....	Pear, .....	Plum, .....	Swan, .....	Other Birds, naming them, .....	Rail or Corn Crane, .....	Other Birds, naming them, .....	Rhododendron, .....	Whin, .....

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

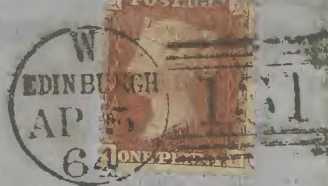
BOOK-POST.

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

Mr ALEXANDER BUCHAN,



To



# SCOTTISH METEOROLOGICAL SOCIETY.

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

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

The Hours of Observation are of Greenwich Time.

During the MONTH of April 1864.

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.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Readings of the H-Cup Anemometer. No. _____		9 A.M.		P.M.		9 h. A.M.								
	Barometer. * No. _____	Attach- ed Ther- mometer	Barometer. 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.	No. _____	9 h. A.M.	9 h. P.M.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	No. _____	No. _____	No. _____					
	inches.	"	inches.	"																											
1	29.18	43	29.25	45	47	50			39	36	38.5	36	SW	W													Sunshine with passing showers of R-S & h. l.	1			
2	29.52	42	29.62	45	49	30.5			41	38	44	39	W	W													Sunshine with passing clouds	2			
3	29.60	44.5	29.40	47	50	34.5			42.5	41	49	47	SW	S													Rain till 3 P.M. overcast afterwards	3			
4	29.70	47	29.89	48	48	38			42.5	42	40.5	4	E	E													Rain till 2 P.M. overcast afterwards	4			
5	30.02	45	30.01	45	46	36			41.5	38	38.5	37.5	E	E													Overcast. A. K. cold rain P.M.	5			
6	30.00	45	29.99	48	51	34			43.5	41.5	45	43	SE	SE													Sunshine from 12 to 3 P.M. Full the rest	6			
7	29.99	48	29.98	52	54	39			50.5	48.5	52	50	SE	SE													Overcast. throughout very mild	7			
8	30.03	52	30.08	53	56	45			51.5	50.5	52.5	53	SW	SW													Do do do	8			
9	30.09	54	30.07	58	63	47			55	51	58	53	W	SE													Bright sunshine A.M. with passing clouds	9			
10	29.97	58	29.87	58	66	43			58	52.5	57	53	W	W													Sunshine with passing clouds	10			
11	29.82	57	29.84	58	53.5	39			49	43	47.5	41	W	W													Sunshine with passing clouds, stormy	11			
12	29.85	50	29.88	57	54	34			48	44	49	42	W	W													Sunshine with passing clouds	12			
13	29.88	46	29.79	52	60	29.5			48	44	52.5	46	SE	S													Bright sunshine throughout	13			
14	29.71	49	29.59	54	64	37			54.5	45	56	46	W	SE													Bright sunshine throughout, very mild	14			
15	29.57	57	29.56	52	59	37.5			50	45	44.5	44	S	SE													Full W.M. Fine warm rain P.M.	15			
16	29.62	57	29.66	54	57	40			47	43	51	41.5	W	W													Sunshine throughout	16			
17	29.71	50	29.70	54	56	36			51	46	48	44	S	W													Sunshine with passing clouds	17			
18	29.70	50	29.70	53	58	34			49.5	46	52	47	S	W													Sunshine with passing clouds	18			
19	29.52	57	29.57	54	61	41			49	45	56	47	SW	SW													Sunshine with passing clouds, very stormy	19			
20	29.63	58	29.69	59	69	47			57	52	61	54	SW	S													Overcast, very mild & warm	20			
21	29.82	57	29.80	62	74	46			63.5	58.5	62.5	52	S	S													Sunshine throughout	21			
22	30.10	58	30.07	60	67	37			52.5	50.5	60.5	50.5	E	SE													Sunshine throughout	22			
23	30.10	54	30.08	60	65	35			50	46	57	49	SE	SE													Sunshine throughout	23			
24	30.15	54	30.12	56	58	38			50	45	53	45	E	SE													Sunshine with passing clouds	24			
25	30.04	53	30.01	52	52	40.5			46	45	44.5	43	SE	SE													Overcast throughout. Light shower till 10 P.M.	25			
26	30.08	52	30.11	54	57	38.5			46	45	47.5	46.5	SE	SE													Sunshine with passing clouds	26			
27	30.14	52	30.10	54	58	37			45	43	49	46.5	SE	E													Overcast throughout	27			
28	30.04	57	30.01	54	57.5	40			46	44	49.5	46.5	E	E													Bright sunshine throughout	28			
29	29.92	52	29.87	57	64	40			53.5	49	58	49.5	W	SE														Bright sunshine throughout	29		
30	29.90	58	29.94	58	57.5	38.5			47.5	43	52.5	44	SE	E														Bright sunshine throughout	30		
31																														31	
Sums.	14 106 10				151	153			4 13 6	4 13 3																					
Means.	29.844	50.5			57.6	38.7			48.8	45.1																					
Total corrections for Instrumental Errors.	+0.60		+0.60						+1	-2	+1	-2																			
Corrected Means.	29.904								48.9449																						
No. of column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

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

TABLE FOR ESTIMATING FORCE OF WIND.			
Estimated Force, 0-5	Common Designation.	Estimated Force, 6-10	Common Designation.
0	Calm	1-5	Light breeze
0.5	Very light air	6	Fresh breeze
1	Light air	7	Very fresh
		8	Blowing hard
		9	Blowing a gale
		10	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ = 29.846  
for Temp. (Col. 2), = 29.944 - 0.098  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ = 29.846  
for Temp. (Col. 4), = 29.944 - 0.098  
Mean at Station, corrected, and at 32°, = 29.846  
Correction for Height, feet, above Mean Sea-level, = 20.9  
Mean, reduced to 32°, and Sea-level, = 30.055  
Highest Reading, corrected for Index error, on the 24 th, = 30.150  
Lowest Do., on the 1 th, = 29.180  
Difference, or Monthly Range, = 0.970

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 21 th, = 74.0  
Lowest in Month, corrected for Index errors, on the 10 th, = 29.5  
Difference, or Monthly Range, = 44.5  
"Corrected Mean" of all the Highest, (Col. 5), = 57.6  
"Corrected Mean" of all the Lowest, (Col. 6), = 38.81  
Difference, or Mean Daily Range, = 18.8  
\*\* Calculated Mean Temperature of Month, = 48.2  
S.-R. THERMOMETER, in Sun, Highest, (corrected, for Index errors), on the 21 th, = 74.0  
Lowest, (corrected for Index errors), on the 10 th, = 29.5  
Difference, or Monthly Range, = 44.5  
"Corrected Mean" of all the Highest, (Col. 5), = 57.6  
"Corrected Mean" of all the Lowest, (Col. 6), = 38.81  
Difference, or Mean Daily Range, = 18.8  
\*\* Calculated Mean Temperature of Month, = 48.2

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 48.9  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 44.9  
Computed Temperature of Dew-point, = 40.6  
Do. Elastic Force of Vapour, = 2.54  
Do. Weight of Vapour in a Cubic Foot of Air, = 73  
Relative Humidity, (Saturation = 100), = 73  
RAIN fell on Days; Amount in Inches, = 0.85

WIND. SUMMARY.											
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	5	1	5	2	4	5	8	0	0		
P.M.	4	5	5	2	4	2	8	0	0		
Mean.	4	3	5	2	4	4	8	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 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

(Signed)

*Mr. Thomson*

P







## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Dalrymple Gardens*, County of *Midlothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *May* 1864.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 6 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depressions or Elevations of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		SUNSHINE. Hours.					9 h. A.M.			Temperature of Well at depth of feet. No.	Temperature at surface and Density.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
		Barometer. * No.	Attached Ther- mometer.	Barometer. No.	Attached 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.	No. 9 h. A.M.	No. 9 h. P.M.			Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.						No. 3 inches.	No. 12 inches.	No. 22 inches.				9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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BAROMETER, "corrected Mean" at 9 A.M. *29.74* (the Correction  $\pm$ ) = *29.84*  
for Temp. (Col. 2), = *29.84* - *0.15* = *29.69*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\pm$  = *29.74*  
for Temp. (Col. 4) = *29.74* - *0.15* = *29.59*  
Mean at Station, corrected, and at 32°, = *29.69*  
Correction for Height, feet, above Mean Sea-level, = *20.9*  
Mean, reduced to 32°, and Sea-level, = *30.04*  
Highest Reading, corrected for Index error, on the *19* th, = *30.13*  
Lowest Do., Do., on the *32* th, = *29.43*  
Difference, or Monthly Range, = *0.70*

\* 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.  
† Engraving corrections for both capillarity and Index Errors.  
‡ The Diurnal Range for Scotland is as yet unknown.  
§ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition only.  
|| While the Diurnal Range is unknown, the Arithmetical Mean of Col. 5 and 6 will be entered as the "Calculated Mean Temperature."  
Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the Observer, in each Schedule. See Over.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *18* th, = *82.0*  
Lowest in Month, corrected for Index errors, on the *31* th, = *30.0*  
Difference, or Monthly Range, = *52.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *62.9*  
"Corrected Mean" of all the Lowest, (Col. 6), = *40.6*  
Difference, or Mean Daily Range, = *22.3*  
\*\* Calculated Mean Temperature of Month, = *57.8*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the *18* th, = *82.0*  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *62.9*  
Lowest at Night, Black Bulb, (corrected for Index errors), on the *31* th, = *30.0*  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = *40.6*  
Difference of above Means or Range ("exposed"), = *22.3*

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

Bulb, = *53.3*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *48.4*  
†† Computed Temperature of Dew-point, = *43.5*  
†† Do. Elastic Force of Vapour, = *1.283*  
†† Do. Weight of Vapour in a Cubic Foot of Air, = *7.0*  
†† Relative Humidity, (Saturation = 100), = *70*  
RAIN fell on *8* Days; Amount in Inches, = *1.60*

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

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

Observations made and  
Return verified by

(Signed)

*W. Thomson*







## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Dalkeith Gardens*, County of *Mid Lothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *June* 186*4*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.								
		9 h. A.M.		4 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bubs.		9 h. A.M.		4 h. P.M.		9 h. A.M.		4 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.					Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom, and Downy.	0-10. 9 A.M. 9 P.M.					
		Barometer. * No.	Attached Ther- mometer.	Barometer. No.	Attached 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.				Velocity (0-10), and Direc- tion.	Amount, (0-10), and Species.	Velocity (0-10), and Direc- tion.	Amount, (0-10), and Species.	Hours.								No. 3 inches.	No. 12 inches.	No. 22 inches.		
																		9 h. A.M.																			9 h. P.M.	
																		inches.	"																		inches.	"
1	29.52	57	29.59	55	63	37			57	45	49	46	W		SW															Sunshine till 3 P.M. heavy showers 3-3.30 P.M.	1							
2	29.67	52	29.69	55	61	33.5			55	45	51	47.5	SW		W															Sunshine P.M. Dull with light showers P.M.	2							
3	29.76	53	29.74	57	61	37			51	47	54.5	48	SE		SE															Sunshine throughout.	3							
4	29.71	55	29.71	56	62	41			54	47.5	56	50	SW		SW																Sunshine with passing clouds.	4						
5	29.60	56	29.41	58	63	44			55	49.5	52.5	52	S		S																Overcast throughout. Rain P.M. heavy in A.M.	5						
6	29.65	56	29.76	61	64	45			58	51	62	55	W		W																Sunshine with passing clouds P.M. Dull	6						
7	29.67	61	29.73	65	74	51			61	57.5	71	59	SW		SW																	Sunshine with passing clouds	7					
8	29.71	62	29.68	67	73.5	44			65.5	58	62	58	SW		S																	Bright sunshine	8					
9	29.78	62	29.78	63	63	49			57	54	54.5	52.5	S		S																	Overcast with slight rain throughout.	9					
10	29.70	59	29.64	62	65	44			52.5	54.5	60	57	S		SW																	Sunshine P.M. H. storm 3.45-4.15 change in	10					
11	29.52	60	29.48	63	68	45			60	53	58	53	S		S																	Sunshine with passing clouds	11					
12	29.56	60	29.55	62	67	46			60	53	60.5	56.5	S		S																	No. No. Thunder shower 11.30 to 12.15 P.M.	12					
13	29.52	60	29.36	63	69	45.5			56	53	62.5	54.5	S		S																	Sunshine passing shower till 11.30 to 12.15 P.M.	13					
14	29.31	60	29.31	62	65	45			61	55	59	55	S		S																	Overcast from 10 A.M.	14					
15	29.30	60.5	29.30	61.5	61	51			57	56	58	55	W		SW																	Rain P.M. Overcast with rain 3.64 P.M.	15					
16	29.57	60	29.71	65	72	50			62	57.5	63	56.5	W		W																	Dull till 11 A.M. Sunshine afterwards	16					
17	29.69	63	29.70	65	63	50.5			61.5	58	61	57	S		SW																	Rain P.M. Overcast with showers P.M.	17					
18	29.71	61	29.73	64	66	47			59.5	54	60	53	SW		W																	Sunshine with passing clouds stormy P.M.	18					
19	29.90	61	29.93	63	66.5	47.5			59.5	54	59	51.5	SW		W																	Sunshine with passing clouds P.M. Dull P.M.	19					
20	29.77	63.5	29.71	65	70	49			64	58	63.5	59.5	S		SW																	No. passing showers P.M. Dull heavy P.M.	20					
21	29.68	62	29.72	64	64	48			56	51	58.5	52	SW		W																		Sunshine with passing clouds	21				
22	29.73	60	29.75	63	65	42			58	52	59	52.5	W		W																		No. No. No.	22				
23	29.70	60	29.75	62	65	44			56	52	57	53	S		SE																		Overcast till 3 P.M. sunshine afterwards	23				
24	29.79	59	29.73	61	65	44			56.5	52	57	53.5	W		W																		Sunshine P.M. Overcast P.M.	24				
25	29.76	60	29.73	62	65	47			57.5	50.5	59.5	52	S		W																		Sunshine throughout a stormy	25				
26	29.69	60	29.78	62	65	45			58.5	50.5	56.5	49	W		W																			Sunshine with passing clouds shower 5.30 P.M.	26			
27	29.98	59	29.99	65	70	47			57.5	51.5	63.5	54.5	W		SW																			Bright sunshine throughout, very fine	27			
28	29.88	61	29.78	63	64	48			58	56	62.5	58	SW		SW																			Overcast throughout, light shower P.M.	28			
29	29.76	60	29.56	62	63	45			56	51	57.5	58.5	SW		SW																			No. No. stormy P.M.	29			
30	29.54	58	29.61	61	63	45			54	50	55	48	SW		SW																			Sunshine throughout high wind.	30			
31																																						
Sums.		2013	1775			111	152		154	124																												
		2013	1775			111	152		154	124																												
		2013	1775			111	152		154	124																												
Means.		29.671	59.2			66.6	45.4		57.7	52.5																												
+ Total corrections for Instrumental Errors.		+060	+060						+1	-2	+1	-2																										
+ Corrections for Diurnal Range.																																						
+ Corrected Means.		29.731							57.8	52.3																												
No. of column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ = *29.657*  
for Temp. (Col. 2), = *29.731* - .080.  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ =  
for Temp. (Col. 4), =  
Mean at Station, corrected, and at 32°, = *29.657*  
Correction for Height, feet, above Mean Sea-level, = *20.9*  
Mean, reduced to 32°, and Sea-level, = *29.860*  
Highest Reading, corrected for Index error, on the *27*th, = *29.990*  
Lowest Do., Do., on the *15*th, = *29.300*  
Difference, or Monthly Range, = *0.690*

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

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

Difference, or Monthly Range, =

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

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

Difference, or Mean Daily Range, =

\*\* Calculated Mean Temperature of Month, =

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

"Corrected Mean" of all the Highest, in Sun, =

Lowest at \_\_\_\_\_, corrected for Index errors, on the *th*, =

"Corrected Mean" of all the Lowest, in Sun, =

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *57.8*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *52.3*

Computed Temperature of Dew-point, = *47.3*

Do. Elastic Force of Vapour, = *3.27*

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

Relative Humidity, (Saturation = 100), = *68*

RAIN fell on *12* Days; Amount in Inches, = *2.10*

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

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

Observations made and Return verified by

(Signed)

*Wm Thomson*







## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Dalkeith Gardens*, County of *Midlothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *July* 186*4*.

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.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.		9 A.M.		P.M.		9 h. A.M.						No.		Temperature of WELL at Depth of feet. No.		Temperature at Surface, and Depth.		9 A.M. 9 P.M.	
		Barometer. No.	Attached Thermometer.	Barometer. No.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No.	No.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Hours.	No. 3 inches.	No. 12 inches.	No. 22 inches.					Temperature at Surface, and Depth.		9 A.M. 9 P.M.					
		Inches.	"	Inches.	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					"	"	"	"	"	"	"	"
		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					"	"	"	"	"	"	"	"
	1	29.67	56	29.70	60	68	43			56	50	56	50	W		SW																		Sunshine A.M. Overcast P.M.	1				
	2	29.40	60	29.20	64	72	46			62	60	61	57	S		SW																		Rain till 3 A.M. Sunshine till 1 P.M. Breeze till 4 P.M.	2				
	3	29.37	58	29.50	58	65	45			57.5	57	57	57	W		W																		Rain till 1 P.M. Overcast 9 P.M.	3				
	4	29.63	56	29.67	61	65	41			56	53	59	51.5	SW		W																		Sunshine throughout.	4				
	5	29.76	57	29.87	61	66	44			56	51	59.5	51	W		W																		do do	5				
	6	30.00	58	30.00	62	69	43			57	50	61.5	55	SW		S																		Passing clouds throughout.	6				
	7	30.05	60	30.05	64	70	47			59	54	61	54	W		W																		Beautiful day bright sun	7				
	8	30.05	60	30.04	66	72.5	46			62.5	58.5	64.5	57.5	SW		S																		do do do	8				
	9	30.04	61	30.01	64	64	48			56	53.5	60	55.5	E		SW																		Overcast A.M. Passing clouds P.M.	9				
5.5-5.8	10	30.09	61	30.00	64	64	49			54	52	59	55	E		E																		Overcast A.M. Sunshine P.M.	10				
5.5-5.8	11	30.17	60	30.00	66	61	45			55.5	53.5	54	51.5	SE		SE																		Overcast throughout.	11				
	12	30.10	57	30.02	60	64	45			57.5	49.5	56	51.5	SE		SE																		Overcast till 3 P.M. Sunshine after.	12				
	13	30.00	57	29.96	61	66	45			54	51	59	55	E		SW																		Sunshine throughout.	13				
	14	29.98	59	29.98	61	62.5	46			54	53	58.5	54.5	SW		SE																		Overcast till 1 P.M. Sunshine after.	14				
	15	30.00	60	29.99	64	67	49			61	56	61.5	56	SE		SE																		Overcast A.M. Sunshine P.M.	15				
	16	29.99	61	29.98	67	74.5	45			61.5	58	67	59.5	SE		W																		Very fine summer day.	16				
	17	30.00	62	30.00	69	80	48			64.5	58	71	63	W		SW																		Bright sunshine very fine day	17				
	18	29.99	68	29.94	73	80	54			71	64	73	65	W		W																		do do do	18				
	19	29.95	68	29.95	72	75	51			64	56.5	68.5	61	W		SW																		do do do	19				
	20	29.88	70	29.82	71	72	56			68.5	62	65	59	W		W																			Overcast throughout.	20			
	21	29.60	69	29.56	69	70	55			65	60.5	59	57	S		W																			Overcast A.M. rain P.M.	21			
	22	29.57	64	29.55	67	68	48			58.5	55	67	54.5	SW		SW																			Overcast till 1 P.M. Sunshine after.	22			
	23	29.70	61	29.65	65	66.5	47			58	51.5	65	62	SW		SW																			Passing clouds throughout.	23			
	24	29.55	63	29.48	62	64.5	57			59	54	57	53	SW		SW																			Hail A.M. Passing clouds and showers P.M.	24			
	25	29.45	61	29.43	64	68	46.5			59	53.5	57	54.5	S		SW																			Passing clouds A.M. Showers 5 P.M.	25			
	26	29.61	61	29.73	63	67.5	42			58	54	58	61	W		W																			Bright sunshine throughout.	26			
	27	29.74	61	29.70	65	68.5	45.5			62	56	62	56	SW		SW																			Passing clouds early A.M. Hail P.M.	27			
	28	29.50	62	29.50	66	70	47			57	56	62	59	S		W																			Rain early A.M. Passing clouds till 1 P.M.	28			
	29	29.73	63	29.82	66	70	47			61	56.5	63	57	SW		SW																			Passing clouds A.M. Hail P.M.	29			
	30	29.71	66	29.80	69	71.5	55			65	60	65	59	SW		W																			Passing clouds throughout.	30			
	31	29.82	66	29.70	67	71	52			63	56	61.5	60	W		S																			Passing clouds A.M. Showers P.M.	31			
	Sums.	1044	11			27	23	16		29	15	11																											
	Means.	29.808				68.8	47.5			59.4	55.1																												
	+ Total corrections for Instrumental Errors.	+0.060		+0.060						+1	-2	+1	-2																										
	+ Corrections for Diurnal Range.																																						
	+ Corrected Means.	29.868								59.554	9																												
	No. of column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ = *29.794*  
for Temp. (Col. 2), = *29.868 - 0.074* = *29.794*  
Corrected Mean of Barometer at 9 P.M., minus the Correction++ = *29.781*  
for Temp. (Col. 4), = *29.868 - 0.087* = *29.781*  
Mean at Station, corrected, and at 32°, = *29.794*  
Correction for Height, feet, above Mean Sea-level, = *0.209*  
Mean, reduced to 32°, and Sea-level, = *29.990*  
Highest Reading, corrected for Index error, on the 11 th, = *30.180*  
Lowest Do., Do., on the 3 th, = *29.370*  
Difference, or Monthly Range, = *0.810*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 17 th, = *80.0*  
Lowest in Month, corrected for Index errors, on the 6 th, = *41.0*  
Difference, or Monthly Range, = *39.0*  
Corrected Mean of all the Highest, (Col. 5), = *68.8*  
Corrected Mean of all the Lowest, (Col. 6), = *47.5*  
Difference, or Mean Daily Range, = *21.3*  
Calculated Mean Temperature of Month, = *58.2*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index errors), on the 17 th, = *80.0*  
Corrected Mean of all the Highest, (Col. 5), = *68.8*  
Lowest at Night, corrected for Index errors, on the 3 th, = *41.0*  
Corrected Mean of all the Lowest, (Col. 6), = *47.5*  
Difference of all the Black Bulb Min. on grass, = *21.3*

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *59.5*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *54.9*  
Computed Temperature of Dew-point, = *54.0*  
Do. Elastic Force of Vapour, = *372*  
Do. Weight of Vapour in a Cubic Foot of Air, = *73*  
Relative Humidity, (Saturation = 100), = *73*  
RAIN fell on 7 Days; Amount in Inches, = *1.25*

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

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; 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*



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

*Snow-depth* may, for convenience, be registered in the rain gauge, under the following conditions:—When snow is present, it must be noted in the "Remarks," and the letter S fixed to the depth of water received in gauge. The depth of 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 detailed in every column the observer cannot be too careful to register observations only; and nothing that partakes of the nature of deduction or inference.

The Council recommend that *terp-ty* observations be taken, viz., on the 21st days of March, June, September, and December, 1907. For these hourly observations separate schedules will be furnished to observers.

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

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

Garman, *op. Decembar 1893*.

*Clouds.*—Convenient abbreviations for Luke Howard's

lightly" downwards, rather than the other.

[illegible]

EDINBURGH.

Tumblers, Bulls, etc., whether planted, or in perfection; whether any have suffered from blight, disease, etc. Potatoes, and other garden stuffs, and whether any have suffered from blight, disease, etc. Whether the Agricultural condition of the district generally.



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Salkehith Gardens*, County of *Midlothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *September* 186*4*.

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.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		Readings of the B-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.			Thermometer, at Depth of feet. No.	Temperature of Air, and Density.					9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		Barometer. No.	Attached Ther- mometer	Barometer. 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	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	No.								3 inches.	12 inches.	22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ = *29.572*  
for Temp. (Col. 2), = *29.646* - *0.074* = *29.572*

"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ = *29.572*  
for Temp. (Col. 4), = *29.646* - *0.074* = *29.572*

Mean at Station, corrected, and at 32°, = *29.572*

Correction for Height, feet, above Mean Sea-level, = *209*

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

Highest Reading, corrected for Index error, on the 25th, = *30.110*

Lowest Do., Do., on the 16th, = *29.100*

Difference, or Monthly Range, = *0.990*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 26th, = *69.0*

Lowest in Month, corrected for Index errors, on the 25th, = *38.0*

Difference, or Monthly Range, = *31.0*

"Corrected Mean" of all the Highest, (Col. 5), = *62.5*

"Corrected Mean" of all the Lowest, (Col. 6), = *43.7*

Difference, or Mean Daily Range, = *18.8*

\*\* Calculated Mean Temperature of Month, = *53.1*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for the 1st, = *69.0*

"Corrected Mean" of all the Highest, (Col. 5), = *62.5*

"Corrected Mean" of all the Lowest, (Col. 6), = *43.7*

Difference, or Mean Daily Range, = *18.8*

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

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *52.1* *51.7*

Computed Temperature of Dew-point, = *47.3* *48.5*

Do. Elastic Force of Vapour, = *3.52* *3.42*

Do. Weight of Vapour in a Cubic Foot of Air, = *82* *79*

Relative Humidity, (Saturation = 100), = *82* *79*

RAIN fell on 9 Days; Amount in Inches, = *2.82*

WIND.		SUMMARY.					
Direction.		N	NE	E	SE	S	SW
A.M.		0	0	1	0	10	8
P.M.		0	0	1	0	10	8
Mean.							

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

Observations made and  
Return verified by

(Signed)

*Mr. Thomson*

P



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 the 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 time, once (morning or evening) for other times, as specified, in the following remarks, or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

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

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

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

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

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

In taking an *Observation*, the attached Thermometer is first noted; the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the 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 ground in an exposed position, free from merely local influences. The lids forming the sides and doors of the Boxes are arranged so as to once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

**Self-Registering Thermometers.**—Professor Phillips's, and Negretti and Zambra's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two 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 discoloured from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 Society.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. Its apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "*Hygrometrical Deductions*." Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by a cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances. One form of "*Mason's*" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the aforementioned 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  $39^{\circ}.9$ ,  $40^{\circ}.0$ , or  $40^{\circ}.1$ ; and, 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  $40^{\circ}.7$ , respectively. So also  $40^{\circ}.3$ ,  $40^{\circ}.7$ ,  $40^{\circ}.8$  respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

*Clouds.*—Convenient abbreviations for Luke Howard's

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

Observations of the 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*,"  $3^{\circ}$  W., (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "*Cloud*" column, an entry of  $2^{\circ}$   $60^{\circ}$  (*i.e.*) 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 *canado-stratus* kind.

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

**Underground Thermometers.**—As the germination and health of crops and plants greatly depend on the temperature of the soil—its amount and constancy; the Council recommend that observations in this interesting department be made at 9 a.m., by Thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from 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. *Geologists* mention whether Schönbach's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and its indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus  $5^{\circ}$ , as an *ozone* entry in the schedule, will indicate that the ozone paper is thrust as  $5^{\circ}$  on the scale, that the wind is from the N.W., and that its force on the scale is  $0-6$  is " $4^{\circ}$ ," *i.e.*, that it is *blowing fresh*.

**Magnetism.**—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 Electrometer is necessary to every complete meteorological observatory.

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

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

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

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

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

(By Order) A. B.

EDINBURGH, 30th December 1863.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	In Leaf Buds.	In Leaf.	Dressed of Leaves.	CROPS.	Sowing or Planting.	Apprenting or above ground.	In Ear.	First Cut.	Alder.	Ash.	Beech.	Birch.	Elm.	Larch.	Lin.	Oak.	Sycamore or Plane.
					Barley.													
					Bare or Bigg.													
					Oats.													
					Wheat.													
					Beans.													
					Pease.													
					Potatoes.													
					Turnips.													
					Rye Grass.													

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	First in Fruit	NEGATORY BIRDS.	First Arrival.	Departure.
Barberry.		Apple.			Cuckoo.		
Doutree or Elder.		Black Currant.			Curlew.		
Broom.		Cherry.			House-Swallow.		
Hazel.		Gooseberry.			Lapwing.		
Hawthorn.		Peach.			Plover.		
Holly.		Sand-Martin.					
Laburnum.		Pear.			Starling.		
Lilac.		Plum.			Swan.		
Mountain Ash or Rowan.		Strawberry.			Rail or Corn Crane.		
Red Flowering Currant.					Other Birds, naming them—		
Rhododendron Ponticum.							
Willow.							

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



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Salkhills 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 *October* 186*4*.

The Hours of Observation are of Greenwich Time.

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.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 h. A.M.		P.M.		9 h. A.M.		P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
	Barometer. No.	Attached Thermometer	Barometer. No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	No.	No.	No.	No.	No.	No.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	Inches.	"	Inches.	"	No.	No.	No.	No.	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Inches.	Inches.	Inches.	Temperature at Depth of Feet, No.						Temperature at Surface, and Density.	9 A.M.	9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
1	30.00	50	30.01	53	55	30			44	43	48	45.5	S	E																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			</

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction ++ for Temp. (Col. 2), = *29.732*  
 "Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = *29.732*  
 Mean at Station, corrected, and at 32°, = *29.732*  
 Correction for Height, feet, above Mean Sea-level, = *20.9*  
 Mean, reduced to 32°, and Sea-level, = *29.941*  
 Highest Reading, corrected for Index error, on the 3 th, = *30.320*  
 Lowest Do., Do., on the 20 th, = *28.520*  
 Difference, or Monthly Range, = *1.800*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 8 th, = *62.0*  
 Lowest in Month, corrected for Index errors, on the 21 th, = *26.0*  
 Difference, or Monthly Range, = *36.0*  
 "Corrected Mean" of all the Highest, (Col. 5), = *52.3*  
 "Corrected Mean" of all the Lowest, (Col. 6), = *36.5*  
 Difference, or Mean Daily Range, = *15.8*  
 \*\* Calculated Mean Temperature of Month, = *44.4*

S.-R. THERMOMETER, Bulb, in Sun, Highest, (corrected for Index errors), = *62.0*  
 "Corrected Mean" of all the Highest, (Col. 5), = *52.3*  
 Lowest at \_\_\_\_\_, (corrected for Index errors), on the \_\_\_\_\_ th, = *26.0*  
 "Corrected Mean" of all the Lowest, (Col. 6), = *36.5*  
 Difference of above \_\_\_\_\_, = *36.0*

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *46.5*  
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *44.6*  
 \*\* Computed Temperature of Dew-point, = *42.5*  
 \*\* Do. Elastic Force of Vapour, = *2.72*  
 \*\* Do. Weight of Vapour in a Cubic Foot of Air, = *8.7*  
 \*\* Relative Humidity, (Saturation = 100), = *87*  
 RAIN fell on 8 Days; Amount in Inches, = *7.36*







# SCOTTISH METEOROLOGICAL SOCIETY.

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

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

During the MONTH of *November* 186*4*.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 6 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	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.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Readings of the B-Cup Anemometer.		9 A.M.		P.M.		9 h. A.M.								
	Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No.	No.	Velocity (0—6), and Direction.	Amount, (0—10), and Species.	Velocity (0—6), and Direction.	Amount, (0—10), and Species.	No.	No.	No.						
	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	30.13	47	30.13	47	48	36			41.5	41	42	41.5	SW		S											Mild but overcast	1				
2	30.09	45	30.04	44	47	31			37	36.5	37.5	37	S		SW											Frost early. Sunshine	2				
3	30.06	43	30.11	46	47.5	31			39	39	46.5	45.5	W		SW											Overcast throughout	3				
4	30.11	46	30.07	48	47.5	37			44.5	42	50.5	49	SW		SW											Fine & dry Sunshine A.M. & P.M.	4				
5	30.22	48	30.35	47	52	38.5			42	41	41.5	39	S		S											Do Do Rain in the night	5				
6	30.50	45	30.50	44	45	29			37	36	35	34	S		S											Fine autumn day clear and bright	6				
7	30.12	43	30.11	45	47	38.5			42	40	46	45	SW		S											Overcast throughout. Mild	7				
8	30.02	45	30.11	46	46	32			39.5	37.5	42	40.5	SE		SE											Fine day sunshine	8				
9	30.00	42	30.11	42	42	26			32	31.7	38	37.5	S		SE											Heavy hoar frost. Clear and bright	9				
10	29.93	40	29.86	40	40.5	26.5			31.5	31	32	31.5	S		SW											Do Do Do	10				
11	29.79	42	29.74	41.5	41	25			34.5	34	38	37	S		S											Overcast throughout	11				
12	29.61	41	29.50	41	42	28			36.5	36	32.5	32	S		S											Bright sunshine. Clear & frosty	12				
13	29.15	41	28.81	42	43	25.5			38	37	43.5	42	S		SE											Fall A.M. Drizzling rain P.M.	13				
14	28.50	45	28.50	46	52	39			45.5	44	44	43	SE		SE											Fine and mild with sunshine	14				
15	28.70	46	28.90	47	46	37			45	44.5	44	43	SE		SE											Rain throughout. stormy	15				
16	29.19	45	29.22	44	43	30			34.5	34	32.5	32	SE		S											Bright sunshine. clear and frosty	16				
17	29.01	41	28.69	44	45	26			40	38.5	45	44	SE		SE											Showerly A.M. Dry with high wind P.M.	17				
18	28.58	46	28.99	47	48	39.5			45.5	44.5	46	44	SW		W											Do Do	18				
19	29.47	45	29.42	47	50	35			40	38.5	45.5	44	SE		S											Sunshine with passing clouds. very mild	19				
20	29.35	46	29.40	47	49	38			44.5	42.5	41.5	41	SE		SE											Do Do	20				
21	29.51	47	29.37	48	50.5	36			45	44.5	46.8	45	S		S											Sunshine A.M. Fall with showers P.M.	21				
22	29.21	46	29.14	46	43.5	34			42	41.2	42	41	SE		S											Overcast A.M. Showerly P.M.	22				
23	29.21	44	29.30	45	44	33			40	39	34.5	34	SW		S											Fine day clear & bright	23				
24	29.28	42	29.02	44.5	41	28.5			33	32	41.5	41	S		SE											Heavy hoar frost. Clear from 9 A.M.	24				
25	28.94	44	28.55	44	42.5	33			37	36.5	37.2	36	S		S											Sunshine A.M. very high wind S.W. Rain 3 P.M.	25				
26	28.59	43	28.71	42	41	30.5			35.5	35	40.8	38	SW		W											Wet night. Sunshine throughout	26				
27	29.24	42	29.30	44	44	35			40	38.5	42	40	S		S											Fine day but hazy	27				
28	29.06	46.5	29.28	47	53	37.5			37.5	35	43	41	S		S											High wind with rain A.M. & showers P.M.	28				
29	29.81	44	29.76	44	46	32			38	36.5	46	44	SW		SW											Clear and sunny A.M. Showerly P.M.	29				
30	29.34	47	29.48	46	49	40			48	48.5	41	38.5	SW		W												High wind & rain A.M. & showers P.M.	30			
31																													31		
Sums.	14.79	129.8			4.11	154			136	136			120.0	1067.9														NOTATION USED IN GENERAL REMARKS.			
Means.	29.493	44.3			46.1	32.5			40.0	38.9																		a. denotes aurora.			
+ Total corrections or Instrumental Errors.	+0.60																											cl. " cirrus.			
+ Corrections for Diurnal Range.																												ci-cu. " cirro-cumulus.			
* Corrected Means.	29.553																											ci-s. " cirro-stratus.			
No. of column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

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

TABLE FOR ESTIMATING FORCE OF WIND.					
Estimated Force, 0-4.	Common Designation.	Estimated Force, 5-9.	Common Designation.	Estimated Force, 10-14.	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard
0-3	Very light air	5-9	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++ = *29.512*  
for Temp. (Col. 2), = *29.553*..... = *29.512*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ =  
for Temp. (Col. 4), = .....  
Mean at Station, corrected, and at 32°, ..... = *29.572*  
Correction for Height, feet, above Mean Sea-level, ..... = *20.9*  
Mean, reduced to 32°, and Sea-level, ..... = *29.781*  
Highest Reading, corrected for Index error, on the 6 th, ..... = *30.500*  
Lowest Do., Do., on the 14 th, ..... = *28.500*  
Difference, or Monthly Range, ..... = *2.000*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 28 th, ..... = *53.0*  
Lowest in Month, corrected for Index errors, on the 11 th, ..... = *25.0*  
Difference, or Monthly Range, ..... = *28.0*  
"Corrected Mean" of all the Highest, (Col. 5), ..... = *46.1*  
"Corrected Mean" of all the Lowest, (Col. 6), ..... = *32.5*  
Difference, or Mean Daily Range, ..... = *13.6*  
\*\* Calculated Mean Temperature of Month, ..... = *39.3*

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, ..... = *40.1*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, ..... = *38.7*  
Computed Temperature of Dew-point, ..... = *36.9*  
Do. Elastic Force of Vapour, ..... = *2.19*  
Do. Weight of Vapour in a Cubic Foot of Air, ..... =  
Relative Humidity, (Saturation = 100), ..... = *89*  
RAIN fell on 8 Days; Amount in Inches, ..... = *2.12*

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	1	5	13	8	1	0			
P.M.	1	2	3	3	13	5	3	0			
Mean.	1	2	2	4	13	6	2	0			

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

Observations made and Return verified by

(Signed) *Wm Thomson*



One of the objects of immediate importance, that the Scottish Meteorological Society has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incompatible, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will, by a scrupulous attention to the following Directions, secure for their Monthly Returns an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several 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 independent Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to meteorological purposes. An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no *adjustment* of the cistern. Its *scale-inches* are not true inches, but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to *form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

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

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

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

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

**Self-registering Thermometers.**—Professor Phillips's, and Negretti and Zamboni's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two 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-mended 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 tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate, again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb should incline slightly downwards, rather than the other.

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

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

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

**Temperature of the Sea.**—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, nothing always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

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

**Electricity.**—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper electrometer is necessary to every complete meteorological observatory. **Remarks.**—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks on remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

The Council recommend that *year-day* observations be taken on the 21st days of March, June, September, and December; for these latter observations separate schedules will be furnished to observers. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

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

(By Order.) A. B.

Ensignman, 24th November 1883.

**Clouds.**—Convenient abbreviations for Luke Howard's nature of deduction or inference.

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

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OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	FRUITS.	MIGRATORY BIRDS.	First Arrival.	First Departure.
Alder,.....	Apple,.....	Cuckoo,.....		
Asp,.....	Black Currant,.....	Curlew,.....		
Beech,.....	Cherry,.....	House-Swallow,.....		
Birch,.....	Hawthorn,.....	Lapwing,.....		
Blm,.....	Holly,.....	Plover,.....		
Larch,.....	Laburnum,.....	Sand-Martin,.....		
Line,.....	Peach,.....	Starling,.....		
Oak,.....	Pear,.....	Swan,.....		
Sycamore or Plane,.....	Strawberry,.....	Other Birds, naming them,.....		

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

BOOK-POST.

EDINBURGH.

10, St Andrew Square,

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN,

To

Dalkeith  
Nov. 1884.

1884



## SCOTTISH METEOROLOGICAL SOCIETY.

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Observations taken at *Dalkeith Gardens*, County of *Mid Lothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea *2* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *December* 186*4*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.				SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.						
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Readings of the H-Cup Anemometer.		9 A.M.		P.M.		9 h. A.M.		under Ground.											
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	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. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL, at Depth of feet.					Temperature at 1 fathom, and Density.	0-10.	9 A.M.	0 P.M.		
		No.	No.	No.	No.	No.	No.	No.	No.	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.	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.	inches.
	1	29.59	45	29.79	45	46.5	36			42.5	40.5	41	40	W	8W																	Beautiful day clear and bright	1				
	2	29.99	44	29.89	45	47	34			40.5	39.5	46.5	45	W	8W																	Thin & mild but overcast	2				
	3	29.79	49	29.72	50	53.5	42.5			51	50	52.5	51	W	4W																	No rain during the night	3				
	4	29.65	52	29.65	53	55	51			53	52	54	52.5	W	8W																	Overcast with slight showers. mild	4				
	5	29.57	53	29.54	54	54	49			52	49.5	49	47	SW	8W																	Thin and mild but overcast	5				
	6	29.55	49	29.52	50	49	59			45	43	47.5	46.5	SW	8W																	Thin & mild with sunshine	6				
	7	29.38	57	29.36	50	51.5	41.5			49	46	46.8	43	SW	8W																	Overcast & stormy A.M. Rain P.M.	7				
	8	29.37	47	29.32	47	43	35			39	38.5	38.5	38	W	8W																	Overcast throughout, slight shower	8				
	9	29.42	45	29.53	43	41	37.5			32.5	31.5	33.5	34.5	W	8																	Bright sunshine clear & frosty	9				
	10	29.57	42	29.45	44	44.5	30			37.5	37	43	41.5	W	8																	Rain till 10 A.M. overcast afterwards	10				
	11	29.18	45	29.10	47	57	38			47.5	44.5	47.5	46	W	8																	Stormy & overcast with slight shower	11				
	12	29.21	48	29.21	47	48.5	38			44	42	42	41.5	W	8																	Overcast. Rain from 3 P.M.	12				
	13	29.42	46	29.48	45	49	39.5			36	35.5	44.5	44	W	8																	No rain 2.30 P.M.	13				
	14	29.68	46	29.71	45	44.5	36			40	38	39	38.5	W	8																	Overcast, slight rain from 3 P.M.	14				
	15	29.70	46	29.61	42	40	34			37.5	37	37.5	36.8	W	8																	Overcast throughout	15				
	16	29.79	44	29.90	44	39	32			39	36	38	38.2	W	8																		No rain very cold	16			
	17	29.89	42	29.80	42	39.5	30			37.5	35	38.5	38	W	8																		Overcast, slight rain from 3 P.M.	17			
	18	29.70	42	29.72	40	37	29			33.5	33	30	28.5	W	8																		Overcast throughout	18			
	19	29.71	40	29.64	41	38	25.5			34	33.5	36.5	35.5	W	8																		Overcast throughout	19			
	20	29.70	40	29.79	40	38	26			34	33	35	34.5	W	8																		Overcast & clear with slight rain P.M.	20			
	21	29.95	41	30.05	41	41	31			38.5	37.5	36	35.5	W	8																		Clear with passing shower of rain. Mild	21			
	22	30.18	41	30.20	40.5	38	28.5			36	35.5	36	35	W	8																		Overcast throughout	22			
	23	30.50	41	30.32	39	36	30.5			35	33	29.5	28.5	W	8																		Overcast & clear & frosty P.M.	23			
	24	30.34	39	29.26	38	36	25			32.5	32	33	32	W	8																		Overcast throughout	24			
	25	30.20	39	30.15	40	37	28			36	35	36	35	W	8																		No rain foggy	25			
	26	30.08	39	30.00	37.5	36.5	26.5			31	30.5	32	31	W	8																		Overcast & clear & frosty	26			
	27	30.00	39	29.88	40	41.5	28			38	36.5	39.5	37.5	W	8																		Overcast & clear P.M.	27			
	28	29.95	40	30.00	41.5	44	31			31.5	31	39.5	37	W	8																		High wind, Sunshine A.M. & P.M.	28			
	29	29.77	43	29.68	44	55	37			45.5	44.5	44.5	42	W	8																		Overcast & clear P.M.	29			
	30	29.47	45	29.55	42	45	38			42.5	40	37	36.5	W	8																		Thin bright day, slight wind last night	30			
	31	29.68	39	29.60	39	34	22			30.5	29.5	32	30	W	8																		Overcast throughout	31			
	Sums.	22.8	17.15	14		164	15			14	13.6																							NOTATION USED IN GENERAL REMARKS.			
	Means.	38	29.78	43.9		43.6	33.1			39.4	37.8																							a. denotes aurora.			
	† Total corrections for Instrumental Errors.	+0.60		+0.60						+1	-2	+1	-2																					m. denotes meteor.			
	Corrections for Diurnal Range.	798																																ms. " meteors.			
	† Corrected Means.	29.84								39.537.6																								ci. " cirrus.			
	No. of column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		ci.-cu. " cirro-cumulus.			
																																			ci.-s. " cirro-stratus.		
																																			cu. " cumulus.		
																																			cu.-s. " cumulo-stratus.		
																																			d. " dew.		
																																			f. " fog.		
																																			fr. " frost.		
																																			h.-fr. " hoar-frost.		
																																			h. " haze.		
																																			h. d. " heavy dew.		
																																			hl. " hail.		
																																			l. " lightning.		
																																			li. cl. " light clouds.		
																																			li. sh. " light showers.		
																																			lu. co. " lunar corona.		
																																			lu. ha. " lunar halo.		
																																				TABLE FOR ESTIMATING FORCE OF WIND.	
																																				Esti- mated Force, 0-6.	
																																			Common Designation.		
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																																			0		
																																			0.5		
																																			1		
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BAROMETER, "corrected Mean" at 9 A.M., is the Correction ++ for Temp. (Col. 2), = *29.84* ..... = *29.764757*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = .....  
Mean at Station, corrected, and at 32°, ..... = *29.764757*  
Correction for Height, feet, above Mean Sea-level, ..... = *2.09*  
Mean, reduced to 32°, and Sea-level, ..... = *29.78966*  
Highest Reading, corrected for Index error, on the *24*th, ..... = *30.340*  
Lowest Do., Do., on the *11*th, ..... = *29.100*  
Difference, or Monthly Range, ..... = *1.240*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *4*th, ..... = *55.0*  
Lowest in Month, corrected for Index errors, on the *31*th, ..... = *27.0*  
Difference, or Monthly Range, ..... = *33.0*  
"Corrected Mean" of all the Highest, (Col. 5), ..... = *43.6*  
"Corrected Mean" of all the Lowest, (Col. 6), ..... = *33.1*  
Difference, or Mean Daily Range, ..... = *10.5*  
\*\* Calculated Mean Temperature of Month, ..... = *38.4*

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, ..... = *39.5*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, ..... = *37.6*  
†† Computed Temperature of Dew-point, ..... = *35.1*  
†† Do. Elastic Force of Vapour, ..... = *2.05*  
†† Do. Weight of Vapour in a Cubic Foot of Air, ..... = .....  
†† Relative Humidity, (Saturation = 100), ..... = *85*  
RAIN fell on *11* Days; Amount in Inches, ..... = *2.30*

WIND.	SUMMARY.											
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.		1	3	3	4	10	6	4	0	0		
P.M.		0	5	5	1	5	11	3	1	0		
Mean.		1	4	4	2	8	8	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 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummied or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

(Signed)

*Wm Thomson*



Dalkeith

*Clouds.*—Convenient abbreviations for Luke Howard's register *observations* only; and nothing that partakes of the nature of deduction or inference.

*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 the snow must be measured in some open place where no drift is observed, and registered in addition on, and at a clock upon, the rain gauge. The snow must be melted, and the water registered in every column; the observer cannot be too careful to indicate in every column the nature of the particles of the nature of detection or inference.

*Units.*—Convenient abbreviations for Luke Howard's

and affixed to a frame separate from the *de Machinon*.<sup>3</sup> 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 boils by high temperatures it will be found in the upper tube, and must be allowed to run out by drawing the stopper out of the side tube, and blowing the air into the lower tube, in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, and the other end upwards.

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. They bulls have a black coating

[illegible]

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.