

## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Leafield Cottage, Rishielaw, Aberdeen*, County of *Aberdeen*, in Lat. *57° 8' 6" N*, Long. *2° 8' 46" W*, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *195½* feet, above Ground *4½* feet.During the MONTH of *January* 187 *2*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.	CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.			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.		Velocity (0-10), and Direction.	Amount (0-10), and Direction.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.	No. 3 inches.	No. 12 inches.	No. 22 inches.						
		No. 236		No. 236		No. 753	No. 107 5/8	No. 7617	No. 2494																						
		inches.	°	inches.	°																										
	1	29.254	45.4	29.282	46.6	45.7	40.0	45.7	25.1	44.5	42.7	41.9	40.7	SW	3	SW	1.5	4.5	0.050				8 h	3						1	
	2	29.220	45.0	29.266	45.3	44.0	36.2	57.3	34.4	41.8	39.7	37.2	36.7	SW	1	SW	1	1.5	0.007				4.5	5						2	
	3	29.418	42.8	29.242	43.2	40.4	33.2	42.9	23.7	35.1	34.0	40.2	39.0	SW	1	SW	2	3	0.280				7.5	6						3	
	4	28.702	43.7	28.756	42.7	43.2	33.3	52.2	28.9	38.7	37.4	35.0	33.2	SW	2	SW	1	4.5	1.007				4.5	5						4	
	5	28.352	42.5	28.660	41.6	38.7	33.4	42.2	26.7	36.1	35.4	34.5	33.6	SW	1	SW	1	2.5	0				7.5	2						5	
	6	28.866	41.4	28.982	42.0	39.9	32.7	61.0	23.5	36.4	34.9	35.4	34.7	SW	1	SW	1	1.5	0				5.5	5						6	
	7	29.008	40.8	28.938	41.7	39.9	32.6	58.4	27.2	34.4	33.6	38.0	37.3	SW	1.5	SW	2	2.5	0.250				6.5	4					skt	7	
	8	28.964	40.5	29.064	42.0	38.5	33.0	50.6	24.4	34.8	33.6	34.3	33.0	SW	1	SW	1	1.5	0.077				4.5	6						8	
	9	29.418	41.7	29.766	42.5	40.8	33.0	49.9	25.1	37.9	37.6	34.3	33.9	SW	1	SW	0.5	1.5	0				7.5	2					haie	9	
	10	29.784	39.9	29.596	41.8	38.2	30.2	41.0	19.5	33.9	33.4	37.6	37.0	SW	1	SW	1.5	2	0.245				7.5	3						10	
	11	29.398	42.0	29.604	43.3	42.0	34.0	58.3	28.0	38.6	38.4	37.5	37.0	SW	1	SW	0.5	2	0.017				7.5	3						11	
	12	29.792	42.0	29.626	43.6	42.4	33.9	43.2	23.0	35.8	35.2	41.8	41.2	SW	1	SW	1.5	2	0.123				9.5	1						12	
	13	29.466	45.6	28.930	48.0	47.0	40.8	45.7	27.3	44.3	44.2	46.3	46.2	SW	1.5	SW	1	2	0.270				10.5	0					Fog.	13	
	14	29.290	46.3	29.676	44.8	47.0	34.6	68.2	35.1	42.3	39.2	35.6	33.8	SW	2	SW	1	3	0				4.5	7						14	
	15	29.610	42.4	29.592	44.2	41.1	33.7	46.8	26.4	35.4	34.6	40.0	39.2	S	1	S	1	2	0.010				9.5	0						15	
	16	29.534	43.9	29.444	44.0	40.8	36.0	56.9	31.3	39.0	38.7	37.0	36.3	S	1	SW	1	1.6	0.120				7.5	4					Fog Am.	16	
	17	28.928	44.3	28.402	47.0	46.2	36.0	44.0	30.8	42.0	41.9	45.7	45.3	S	1	SW	1.5	3	0.083				10.5	0					Fog	17	
	18	28.022	46.8	28.482	46.0	46.7	38.3	48.8	40.9	44.3	43.8	39.4	37.8	S	1.5	SW	2	3.5	0.013				8.5	0						18	
	19	28.812	44.0	29.112	44.9	42.1	36.8	65.2	32.4	39.6	37.9	39.7	38.1	SW	2	SW	3	4	0				5.5	4						19	
	20	29.322	43.2	29.318	42.3	40.6	33.4	50.4	25.4	35.6	34.7	35.9	34.8	SW	0.5	SW	1	1.5	0				7.5	3						20	
	21	29.400	41.1	29.496	41.3	37.3	30.6	66.8	17.9	32.0	31.2	33.9	33.0	SW	0.5	SW	1	1.5	1.005				5.5	5						21	
	22	29.440	40.6	29.286	42.7	39.5	29.7	54.0	18.8	34.0	33.7	38.7	38.0	S	0.5	S	1	1.5	10.020				9.5	0					Fog	22	
	23	28.904	43.3	28.626	45.7	43.3	36.8	45.0	31.6	40.8	40.4	42.6	42.2	SE	2	SE	3	4	0.283				10.5	0					Fog	23	
	24	28.478	45.4	28.396	46.4	43.0	38.9	44.7	37.8	42.0	41.3	40.0	39.0	SE	1	SW	1	2.5	0.320				10.5	0					Fog	24	
	25	28.754	45.3	29.056	47.4	44.5	35.2	48.6	28.9	41.5	41.3	43.1	43.0	S	1	S	1.5	2	0.315				10.5	0						25	
	26	29.300	46.8	29.558	48.4	44.2	41.3	46.4	38.4	43.2	43.2	43.3	43.0	SE	1	SE	0.5	1.5	0.070				10.5	0						26	
	27	29.716	46.0	29.804	46.0	44.7	36.0	57.3	36.8	41.0	40.4	36.5	35.0	SW	1.5	SW	0.5	2	0				7.5	3						27	
	28	29.816	42.2	29.748	44.2	40.6	30.6	50.8	18.2	30.6	30.0	40.0	39.1	SW	1	SW	1	1.5	0.107				6.5	3						28	
	29	29.540	44.9	29.282	46.3	44.0	39.2	43.6	21.3	42.0	41.8	42.9	42.7	SW	1	SW	1	2	0.193				10.5	0					Fog.	29	
	30	29.292	47.9	29.300	49.2	50.1	42.1	57.3	38.8	47.8	46.7	46.9	45.2	SW	1	SW	2	3	1.010				8.5	3						30	
	31	29.358	48.0	29.166	49.7	48.0	42.6	48.7	38.4	45.7	44.6	47.0	45.9	SW	1.5	SW	2.5	4	2.010				8.5	2						31	
	Sums.	905.178	132.4	905.456	132.8	132.44	1038.1	1585.9	888.0	1211.1	1185.5	1222.2	1194.9	380	41.0	148.3	0.385	228	79												
	Means.	29.199	43.7	29.208	44.6	42.71	33.42	51.46	28.64	39.02	38.24	39.44	38.54	123	1.33	4.8	0.099	7.5	2.6												
	† Total Corrections for Instrumental Errors.	-0.013	-	-0.013	-	+0.2	+0.1	0	-0.2	0	0	0	0	0.6	0.6																
	‡ Corrections for Diurnal Range.																														
	“Corrected Means.”	29.186	43.7	29.195	44.7	42.9	33.5	51.2	28.4	39.1	38.2	39.4	38.5	123	1.33	4.8	0.099	7.5													
	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



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

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

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

**Barometre.**—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. No can any Barometre 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 Barometre shall have been compared with a *Standard*.

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

An excellent Barometre is constructed by Mr. A. de la Roche, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its scale-values 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 Barometre, the sides of the cistern are of flexible, 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 Barometre having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *serve up* the mercury to within a quarter of an inch of the top of the tube and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometre 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 top* is produced. If this is prevented by air, it may be removed to the cistern, and got rid of, by inverting the Barometre (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this still fails the instrument must be repaired.

The Barometre should be suspended in a good *lytle*, 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 Thermometre 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 Barometre.

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

**Self-registering Thermometers.**—Professor Phillips, 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 *columns* of spirit breaks, it may be re-united by stirring the instrument, repeatedly against the palm of the hand, when part of the spirit divides, by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

**Protection of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such 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. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must hang down by at least an inch free from the scales and frame to which they are attached; the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the mastin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer, that the mastin 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, also supports the water cup underneath. This management must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the recommended requirements shall be complied with, as far as possible.

**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—35.2, 40.0, or 40.1; or again, 40.4, 40.3, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40.3, and 40.7, or 40.8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

**Clouds.**—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less 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 appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 6, S. W., (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of 2, 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 paper column. **Underground Thermometers.**—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and consistency,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

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

**Ozone.**—Mention whether Schumbert's or Mofett's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—Thus 8° is an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as 8° on the scale, that the wind is from the N. W., and that its force on the scale 0-6 is "4"; i.e., that it is *blowing fresh*.

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

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

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

**Observations in connection with the periodic return of the seasons.** possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. 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 *yearly* day observations be taken;—viz., on the 21st days of March, June, September, and December.

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

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

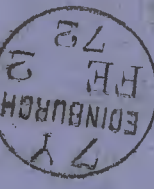
FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.
Alder, . . . . .					Barley, . . . . .				
Ash, . . . . .					Bere or Bigg, . . . . .				
Beech, . . . . .					Oats,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

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

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

BOOK-POST.

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





## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Seafish Cottage, Rubislaw*, <sup>Aberedeen</sup> County of *Aberedeen*, in Lat. *57° 8' 6" N*, Long. *2° 46' 4" W*, Distance from Sea *3* miles.  
Height of Cistern of the Barometer above Mean Sea-level *195½* feet, above Ground *4½* feet. During the MONTH of *February* 187*2*.  
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.  As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms, including Thunder and Lightning, began and ended.		Days of Month.
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.									
		Barometer, No. 236	Attach- ed Ther- mometer	Barometer, No. 236	Attach- ed Ther- mometer	Max. No. 733	Min. No. 733	Max. in Shade, 4 feet above Ground.	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches. No. 233	Velocity (0-10), and Direction.	Amount (0-10), and Direction.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.	No. 3 inches.	No. 12 inches.	No. 22 inches.					
		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.					
	1	28.994	48.8	29.260	48.1	48.2	41.7	70.1	41.8	45.6	44.7	43.9	42.7	SW	3	SW	2	4	6	0.385									Fog	1	
	2	29.136	48.1	29.380	47.2	45.4	39.9	66.4	33.8	41.0	39.9	41.8	40.7	SW	1	SW	2	3	1	0.010										2	
	3	29.588	45.5	29.534	47.4	44.8	38.3	69.4	30.2	40.9	40.6	41.7	41.0	SW	1.5	SW	1	2	6	0.250										3	
	4	29.434	46.3	29.688	46.8	44.1	40.1	79.0	37.2	42.7	41.9	41.8	41.3	SW	2	S	1	3.5	4	0.205									Magnificent Red Sun!!!	4	
	5	29.542	46.7	29.436	47.0	43.7	40.3	42.0	36.3	42.3	42.1	42.4	42.0	SE	2.5	S	1.5	3.5	10	0.345									Fog, sleet, hail	5	
	6	29.378	46.6	29.522	47.5	46.0	41.0	70.4	37.0	43.8	43.5	41.7	40.5	S	2	SW	0.5	2.5	1	0.010										6	
	7	29.674	44.8	29.758	45.0	46.7	34.3	82.0	26.3	37.3	36.7	36.0	35.4	SW	0.5	N	0.5	1	0	0										7	
	8	29.796	42.2	29.858	45.3	40.5	31.0	64.3	19.6	32.3	31.8	39.0	39.0	S	0.5	S	0.5	1	3	0.015										8	
	9	29.756	45.0	29.598	46.2	44.0	39.0	53.2	24.2	42.9	42.1	43.9	43.8	SE	1	SE	1	1.5	8	0.225										9	
	10	29.570	46.5	29.596	48.0	47.3	41.8	75.3	37.4	43.0	42.6	44.4	44.4	S	1	S	0.5	1.5	6	0.115									Fog	10	
	11	29.604	47.9	29.670	49.0	46.6	42.4	51.2	32.9	44.4	44.3	44.0	43.7	SW	0.5	SW	0.5	1	10	0.210									Fog	11	
	12	29.684	47.7	29.704	47.2	45.0	39.3	55.4	40.3	44.0	43.3	40.7	39.6	SE	1.5	SE	2	2.5	6	0.017										12	
	13	29.702	46.4	29.742	47.0	42.2	39.2	42.6	37.9	41.4	40.9	41.0	40.2	SE	1.5	SE	1	3	16	0.515									Fog	13	
	14	29.740	45.6	29.706	45.8	41.6	38.0	43.4	37.8	39.6	38.9	39.8	38.8	SE	1.5	SE	1.5	2	12	0.230									sleet, hail	14	
	15	29.700	45.4	29.710	45.6	41.7	37.7	41.6	37.3	41.3	40.4	38.9	38.0	S	1	SE	1.5	2	4	0.080										15	
	16	29.606	44.7	29.470	44.4	39.9	36.3	44.3	36.0	38.1	37.4	37.3	36.7	SE	1.5	SE	2	3	18	0.490									sleet, hail	16	
	17	29.336	43.8	29.302	45.1	42.2	35.7	63.2	30.3	38.0	37.6	40.9	40.1	SW	1	S	1	1.5	8	0.350									si. li. evening	17	
	18	29.166	44.9	29.290	45.0	42.9	36.4	78.8	33.3	38.9	38.1	37.3	36.4	SW	1.5	SW	0.5	2	2	0.010										18	
	19	29.224	43.0	29.390	44.4	43.5	34.7	57.0	27.3	38.8	37.5	37.0	36.4	SW	1	SW	0.5	2	1	0.017									Lunar Corona, evening	19	
	20	29.432	42.3	29.442	44.7	42.2	34.1	78.0	26.1	36.6	35.8	38.3	37.9	SW	1	S	0.5	1	0.5	0.005										20	
	21	29.538	42.8	29.740	45.0	45.2	33.4	102.0	26.9	37.6	36.0	39.0	37.5	W	0.5	W	1	1	3	0.035										21	
	22	29.782	42.8	29.600	45.4	43.8	32.0	51.0	22.0	37.8	37.0	42.4	42.1	SW	1	SW	1	1.5	8	0.073									Fog	22	
	23	29.492	44.9	29.524	46.8	47.9	37.0	97.5	31.8	41.6	40.2	37.0	36.7	W	0.5	SW	0.5	1	3	0.010									si. li. evening	23	
	24	29.470	43.8	29.426	46.9	42.8	31.7	49.9	22.3	39.4	39.0	41.2	40.6	SE	1	SE	2.5	3	16	0.450										24	
	25	29.360	45.0	29.480	45.7	42.3	39.1	45.1	34.5	42.0	41.8	41.0	40.5	E	3	SE	3	4-5	18	0.955										25	
	26	29.728	43.9	29.886	44.9	43.0	37.0	71.6	36.0	38.4	35.8	37.9	37.0	NE	1	N	0.5	3	3	0.023									aur.	26	
	27	29.984	43.2	29.938	45.0	43.2	36.0	59.6	28.6	38.0	37.0	38.4	36.5	W	1	SE	1	1.5	0	0										27	
	28	29.744	42.6	29.416	44.5	41.8	33.7	73.6	27.3	35.7	33.9	40.0	39.0	S	0.5	S	1.5	2	0.5	0.025										28	
	29	29.102	45.3	29.178	49.0	53.4	38.9	104.0	33.9	45.1	43.9	45.4	43.6	SW	1	W	1	1.5	5	0.053										29	
	30																													30	
	31																													31	
Sums.		856.302	1306.5	857.244	1340.1	1281.9	1080.0	1881.9	926.3	1168.5	1124.7	1174.6	1152.1	36.5	33.5			179	5.090												
Means.		29.52765	45.05	29.5601	46.2	44.2	37.24	64.9	31.94	40.3	39.47	40.5	39.73	1.26	1.16					7.76											
+ Total Corrections for Instrumental Errors.		-0.013		-0.013		+0.2	+0.1	0	-0.2	0	0	0	0																		
+ Corrections for Diurnal Range.																															
"Corrected" Means.		29.515	45.0	29.547	46.2	44.4	37.3	64.9	31.7	40.3	39.5	40.5	39.7	1.26	1.16			6.2	0.175												
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.471  
for Temp. (Col. 2), = 29.515 - 0.044  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.501  
for Temp. (Col. 4), = 29.547 - 0.046  
Mean at Station, corrected, and at 32°, = 29.486 29.590  
Correction for height, 195½ feet above Mean Sea-level, = +0.218 +0.114  
Mean, reduced to 32°, and Sea-level, = 29.704 29.704  
Highest Reading, corrected for Index error, on the 27 th, = 29.971 30.075  
Lowest Do. Do. on the 1 st, = 28.981 29.086  
Difference, or Monthly Range, = 0.990 0.990

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 29 th, = 33.6  
Lowest in Month, corrected for Index errors, on the 8 th, = 31.1  
Difference, or Monthly Range, = 2.5  
"Corrected Mean" of all the Highest, (Col. 5), = 44.4  
"Corrected Mean" of all the Lowest, (Col. 6), = 37.3  
Difference, or Mean Daily Range, = 7.1  
\*\* Calculated Mean Temperature of Month, = 40.8  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 29 th, = 104.0  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 64.9  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 8 th, = 19.4  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 31.7  
Difference of above Means or Range ("exposed"), = 33.7

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 40.4  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 39.6  
†† Computed Temperature of Dew-Point, = 38.6  
†† Do. Elastic Force of Vapour, = 0.234 In.  
†† Do. Weight of Vapour in a Cubic Foot of Air, = 2.74 Grs.  
†† Relative Humidity, (Saturation = 100), = 91  
RAIN fell on 27 Days; Amount in Inches, = 5.09

WIND.												SUMMARY.	
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.	1.26	1.16
A.M.	0	1	1	7	5	12	3	0	0				
P.M.	2	0	0	9	7	9	1	1	0				
Mean.	1	1	0	8	6	10	2	1	0			1.21	1.16

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

Evaporation = 0.950 In.

Greatest Daily Range on 29 = 14.5

Observations made and Return verified by *Alex. Beverly, assisted by Janitor of Grammar School*

(Signed) *Alex. Beverly*

x Actual Readings at Gram. School  
Highest 27 th 30.086  
Lowest 1 st 29.095  
Difference 0.991



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

One of the objects of immediate importance that the British 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 comprehensiveness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

**Hour of Observation.**—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (naming an 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 cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

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

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-inches* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their 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 setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *zenith*, as a slight error removed from its fastenings, the ivory peg must be screwed so as to form a right angle to the cistern, then set 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 upperside. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument, so that the mercury strikes the top of the tube, a *sharp lap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

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

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

**Protection of Thermometers.**—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from 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 free the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, *Self-registering Thermometers*,—Professor Phillips, and Negretti and Zambra's Patent *Maximum* Thermometers are recommended; printed directions for their use may be obtained with each instrument. The *"Minimum"* Thermometer of Kithleyford is recommended when graduated on the glass stem and attached 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 sucking the instrument repeatedly against the palm of the hand; when part of the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

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

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

The frame of the Thermometers 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 Thermometers.**—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—89°·9, 40°·0, or 40°·1; or again, 40°·4, 40°·5, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40° or 40½° respectively. So also 40½° and 40°·7, or 40°·8, more or less must be registered 40°·2 or 40°·3, and 40°·7 or 40°·8 Thermometers, the reading Rutherford's *"Max"* and *"Min"* Thermometers. In the reading of that end of the *index* which is next to the surface of the mercury or alcohol is done noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

*Snowfalls* may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, 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 parades 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 observation of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered 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 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, *cast*, 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.

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

**Temperature of the Sea.**—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, 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 Schönborn's or Meißner's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3 W., as an ozone entry in the schedule will indicate that the ozone paper is fixed as 3°·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 unfortunately 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 barometrical, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

*Observations* in connection with the periodic return of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and straws; 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 *farm day* observations be taken;—viz., on the 21st days of March, June, September, and December.

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

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

EDINBURGH, 19th November 1892. (By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

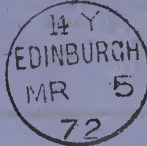
FOREST TREES.	In Flower.	Leaf Beds First appear.	In Leaf.	Drosted of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.
Alder, . . . . .					Barley, . . . . .				
Ash, . . . . .					Bere or Bigg, . . . . .				
Beech, . . . . .					Oats,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

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

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

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

MR ALEXANDER BUCHAN,





## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Seafeld Cottage, Rubislaw, Aberdeen, County of Aberdeen*, in Lat.  $57^{\circ}8'6''N$ , Long.  $2^{\circ}46'4''W$ , Distance from Sea  $(2.87 = \frac{1}{3})$  miles.  
Height of Cistern of the Barometer above Mean Sea-level  $195\frac{1}{2}$  feet, above Ground  $4\frac{1}{2}$  feet. During the MONTH of *March* 187 *2*

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs, 9 A.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H. Cup Anemometer No. 227 at 9 h. A.M.		No. of hours in which it fell.		Amount in inches.		A.M.					P.M.		SUNSHINE.	9 h. A.M.			Temperature of WELL at depth of feet No. 1.	Temperature of surface air, and humidity.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		Barometer. No. 236	Attached Thermometer.	Barometer. No. 236	Attached Thermometer.	Max. No. 233	Min. No. 235	Max. in Sun rays No. 242	Min. on Grass. No. 245	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force in Miles.	Direction.	Force in Miles.	No. of cups.	No. of cups.	Velocity (0-10) and Direction.	Amount (0-10) and Species.	Velocity (0-10) and Direction.	Amount (0-10) and Species.	No. 1 inches.					No. 12 inches.	No. 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction †† =  $29.503$   
for Temp. (Col. 2), =  $29.503$   
“Corrected Mean” of Barometer at 9 P.M., minus the Correction †† =  $29.503$   
for Temp. (Col. 4), =  $29.503$   
Mean at Station, corrected, and at 32°, =  $29.504$   $29.608$   
Correction for height,  $195\frac{1}{2}$  feet above Mean Sea-level, =  $+0.218$   $+0.114$   
Mean, reduced to 32°, and Sea-level, =  $29.722$   $29.722$   
Highest Reading, corrected for Index error, on the 10 th, =  $30.047$   $30.152$   
Lowest Do. Do. on the 28 th, =  $28.973$   $29.077$   
Difference, or Monthly Range, =  $1.074$   $1.075$

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 4 th, =  $55.5$   
Lowest in Month, corrected for Index errors, on the 21 th, =  $28.8$   
Difference, or Monthly Range, =  $26.7$   
“Corrected Mean” of all the Highest, (Col. 5), =  $43.3$   
“Corrected Mean” of all the Lowest, (Col. 6), =  $37.1$   
Difference, or Mean Daily Range, =  $8.2$   
\*\* Calculated Mean Temperature of Month, =  $41.2$   
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 27 th, =  $107.5$   
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, =  $80.9$   
Lowest at Night, Black Bulb, (corrected for Index errors), on the 21 th, =  $23.1$   
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, =  $31.6$   
Difference of above Means or Range (“exposed”), =  $49.3$

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), =  $40.6$   
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), =  $39.3$   
†† Computed Temperature of Dew-Point, =  $37.7$   
†† Do. Elastic Force of Vapour, =  $0.226$  in.  
†† Do. Weight of Vapour in a Cubic Foot of Air, =  $2.63$  grs.  
†† Relative Humidity, (Saturation = 100), =  $90.8$   
RAIN fell on 29 Days; Amount in Inches, =  $2.278$   
Note:  $1.700$

WIND.											
SUMMARY.											
Direction.	N	NE	E	SE	S	SW	W	NW	Calms or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	4	1	0	7	8	2	5	1	1.08	
P.M.	3	6	2	1	3	12	0	4	0	1.00	
Mean.	3	5	1	1	5	10	1	4	1	1.04	2.16

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

Observations made and Return verified by *Mr. Beverly, assisted by Sergeant Sproule*  
*Janitor, Grammar School, Aberdeen*

(Signed) *Alex. Beverly*

At Grammar School, the actual readings on the same days at the same hours were  
Highest  $30.167$   
Lowest  $29.095$   
Difference  $1.072$

Col. 17. The instrument has been repaired but I question whether it is to be relied on. A.B.



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 Means from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

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

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

Two moderate-sized Barometers have been approved 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-ticks* 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 *under-line* on this little piston-rod is brought, by the adjusting screw, to *join one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary setting* must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

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

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

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

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

*Self-registering Thermometers.*—Professor Phillips, 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 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-joined by rattling the instrument repeatedly against the palm of the hand; if any part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These statements should be hung horizontally.

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

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

*Registration of Thermometers.*—No instrument ought to be used for Meteorological purposes till it has been, generally 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 the Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

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

*Reading of the Thermometer.*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—69.9, 40.0, or 40.1; or again, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40.5°, respectively. So also 40.3, and 40.7, or 40.8 respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

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

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the *sky overhead* (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *cloud* column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of clouds is *rated* 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," 9, S. W., (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S. W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "*Cloud*" column, an entry of 2, <sup>cr-st.</sup> (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 *pro* or *con* column. *Underground Thermometers.*—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and consistency,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays and fitted with sloping tin collars to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

*Temperature of the Sea.*—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 13th, and 25th of each month, the thermometer ought to be sunk exactly 85 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 Schloeben's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 8 <sup>1</sup>/<sub>2</sub>, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N. W., and that its force on the scale 0—6 is "4"; i.e., that it is *blowing fresh*.

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

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

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

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

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

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

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

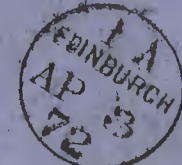
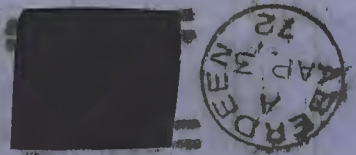
SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry, . . . . .		Apple, . . . . .			Cuckoo, . . . . .		
Bourtree or Elder, . . . . .		Black Currant, . . . . .			Curlew, . . . . .		
Broom, . . . . .		Cherry, . . . . .			House-Swallow,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

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

EDINBURGH.

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

MR ALEXANDER BUCHAN,





## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Seafield Cottage, Rubislaw, Aberdeen, County of Aberdeen, in Lat. 57° 8' 6" N, Long. 2° 8' 46" W, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 195½ feet, above Ground 4½ feet.During the MONTH of April 1872.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	13. BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.  As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms, including Thunder and Lightning, began and ended.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulb.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H. Cup Anemometer. No. 2237		No. of hours in which it fell.		Amount in inches.		Velocity (0-10), and Direction.		Amount (0-10), and Direction.						Sunshine. Hours.		9 h. A.M.		Temperature of Well, at depth of feet, No.		Temperature at 1 fathoms, and Density.		9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		Barometer. No. 236	Attached Thermometer.	Barometer. No. 236	Attached Thermometer.	Max. No. 333	Min. No. 407	Max. No. 333	Min. No. 407	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force 0-6.	Direction.	Force 0-6.	No. of hours in which it fell.	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.	Amount (0-10), and Direction.	Amount (0-10), and Direction.	No. 3 inches.	No. 12 inches.	No. 22 inches.						Temperature at 1 fathoms, and Density.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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## NOTATION USED IN GENERAL REMARKS.

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

## TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.630  
for Temp. (Col. 2), = 29.682, minus 0.052... = 29.630  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction††  
for Temp. (Col. 4), = 29.710, minus 0.056... = 29.654  
Mean at Station, corrected, and at 32° = 29.642 29.745  
Correction for height, 195½ feet above Mean Sea-level, = +0.216 +0.113  
Mean, reduced to 32°, and Sea-level, = 29.858 29.858  
Highest Reading, corrected for Index error, on the 5 th, = 30.213 30.317  
Lowest Do. Do., on the 23 th, = 29.223 29.326  
Difference, or Monthly Range, = 0.990 0.991

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 14 th, = 59.9  
Lowest in Month, corrected for Index errors, on the 19 th, = 33.8  
Difference, or Monthly Range, = 26.1  
"Corrected Mean" of all the Highest, (Col. 5), = 50.4  
"Corrected Mean" of all the Lowest, (Col. 6), = 39.1  
Difference, or Mean Daily Range, = 11.3  
\* Calculated Mean Temperature of Month, = 44.7  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 16 th, = 120.0  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 99.2  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 5 th, = 28.1  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 32.6  
Difference of above Means or Range ("exposed"), = 66.6

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 44.6  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 42.7  
†† Computed Temperature of Dew-Point, = 40.5  
†† Do. Elastic Force of Vapour, = 0.252 in.  
†† Do. Weight of Vapour in a Cubic Foot of Air, = 2.88 lbs.  
†† Relative Humidity, (Saturation = 100), = 86.2  
RAIN fell on 24 Days; Amount in Inches, = 2.997  
Rose Street 2.340

SUMMARY.											
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	4	2	0	5	5	6	1	7	0	1.23	
P.M.	6	3	0	3	2	12	0	6	0	1.07	
Mean.	5	2	0	4	4	8	1	6	0	1.15	1.32 lbs.

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

Evaporation = 2.173 inches

Greatest daily range 22.9 on the 24th

(Signed) Alex. Beverly

Observations made and Return verified by Alex. Beverly, assisted by Sergeant Shumale Janitor, Grammar School, Aberdeen

\* Actual readings at Grammar School, same days as above, when the barometer at Grammar School & Seaf



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 comprehensiveness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

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

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

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

An excellent Barometer is constructed by Mr. A. C. of London, the use of which is attended with the great convenience of *not requiring an 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 *vertical*.

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

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

In *taking an observation*, the attached Thermometer is first noted; the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index;—usually the lower edge of the vening, 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 hand and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

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

**Self-registering Thermometers.**—Professor Phillips, and 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 stirring the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from there by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

from radiation during night. Their bulbs have a black coating, which may easily be made or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "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 the face of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

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

**The Hygrometer** consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "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 bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the moist cloth in ordinary circumstances, will proceed as from the most cloth in ordinary circumstances.

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

**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—89.9, 40.0, or 40.1; or again, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40.5°, respectively. So also 40.2, and 40.7, or 40.8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings must be rapidly taken, being so readily affected by heat from the person of the observer.

**Hour of observing Temperature.**—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 24, are those of a series of phenomena commencing at 9 P.M. on the 24, and extending till 9 P.M. on the 25.

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

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

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

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

**Snowfall 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 Lake Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *cloud* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale 0 to 10; thus, when the sky overhead is *half covered* by clouds, 5 is entered as the *observed*, 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 6, S. W." and Direction, 2, W." (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S. W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{2}$ , or  $\frac{1}{1}$ , (*e.g.*) will indicate that the higher clouds are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to that 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 *progr.* 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 the flow of river water. At or near the time of high water, on the 5th, 15th, and 25th, of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

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

**Ozone.**—Mention whether Schönbien's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus  $\frac{3}{10}$ , 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, &c. Remarks ought to be made on the concurrence 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 items as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

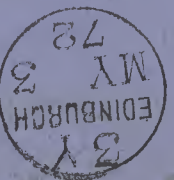
SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry, . . . . .		Apple, . . . . .			Cuckoo, . . . . .		
Bourtree or Elder, . . . . .		Black Currant, . . . . .			Curlew, . . . . .		
Broom, . . . . .		Cherry, . . . . .			House-Swallow,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

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

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

MR ALEXANDER BUCHAN,

EDINBURGH





## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Seafield Cottage, Rubislaw, Aberdeen, County of Aberdeen*, in Lat.  $57^{\circ}8'6''N$ , Long.  $2^{\circ}8'46''W$ , Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level  $195\frac{1}{2}$  feet, above Ground  $4\frac{1}{2}$  feet.During the MONTH of *May* 187*2*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.		Days of Month.
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulb.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.									
		Barometer. No. 226	Attached Thermometer No. 236	Barometer. No. 236	Attached Thermometer No. 236	Max. No. 233	Min. No. 207	Max. in Sun's rays No. 237	Min. on Grass. No. 239	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force. 0-16.	Direction.	Force. 0-16.	No. of hours in which it fell.	Amount in inches. No. 2242	Velocity (0-10) and Direction.	Amount (0-10) and Species.	Velocity (0-10) and Direction.	Amount (0-10) and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.					
		inches.		inches.																											
	1	30.058	55.0	29.990	57.3	58.6	50.1	101.6	45.9	55.5	53.9	54.7	52.9	SW	1.5	W	1	75	0 1/2	0.005			7								1
	2	29.930	55.8	30.008	55.7	63.7	47.1	127.0	45.7	55.3	50.9	47.9	45.7	SW	1	W	0.5	150	0 1/2	0.008			12								2
	3	29.718	53.3	29.254	53.7	51.2	42.4	71.0	29.3	47.7	45.6	48.3	45.0	SW	1.5	SW	1	75	6	0.125			3								3
	4	28.910	50.8	28.860	50.5	50.6	41.8	102.2	29.3	44.1	43.0	44.3	43.4	SW	1.5	W	1.5	180	6	0.217			0					Fog.			4
	5	29.108	49.5	29.244	52.0	55.6	41.4	136.0	37.0	49.2	45.7	47.9	46.7	W	1	W	0.5	175	9	0.307			6					Hail			5
	6	29.190	51.0	29.152	51.7	49.0	43.7	80.3	36.2	45.7	45.0	44.5	43.7	SE	1	W	0.5	20	2	0.015			0					Fog			6
	7	29.076	50.3	29.058	52.0	51.2	43.0	119.3	32.8	48.7	46.7	44.3	43.2	SE	1	W	0.5	10	0	0			4					So. ha. 10-12 Am.			7
	8	29.124	50.3	29.410	51.2	51.2	40.7	123.0	29.3	47.8	44.8	44.0	41.7	W	1	W	1	15	4	0.093			3					Hail			8
	9	29.596	49.3	29.896	51.4	52.5	40.7	130.0	31.6	47.0	43.7	43.7	41.8	W	1	W	0.5	105	4	0.053			8								9
	10	30.140	49.7	30.160	50.0	49.3	38.4	128.4	29.6	42.7	40.6	42.0	38.0	W	1	W	1	100	1	0.007			7					Snow 8 Am.			10
	11	30.102	48.3	30.052	48.8	46.3	36.2	107.6	26.4	40.0	38.0	43.2	40.9	W	1.5	W	1	130	4	0.123			4								11
	12	29.876	49.2	30.016	50.8	48.7	41.8	76.0	38.3	44.2	43.8	46.3	45.9	W	1	S	0.5	310	4	0.080			0					Fog			12
	13	30.138	50.4	30.036	51.3	51.0	43.1	117.9	39.2	48.0	45.8	46.5	45.1	W	1	W	1	105	4	0.087			3								13
	14	29.950	51.9	29.902	52.0	57.5	45.1	126.7	42.6	52.5	51.3	50.8	50.2	W	1.5	W	1	300	18	0.775			0					Hail. Th. 6-7 Am.			14
	15	29.804	52.5	29.810	53.4	54.0	45.7	125.4	45.6	48.6	48.0	48.3	47.4	SE	1	W	0.5	175	10	0.315			6					Fog Am.			15
	16	29.618	52.4	29.612	52.3	49.4	43.2	57.2	43.1	47.2	46.9	44.3	43.4	W	1.5	W	1	115	12	0.415			0					Fog			16
	17	29.610	50.6	29.652	49.0	47.0	39.9	102.3	37.2	44.0	41.3	40.0	38.0	W	1	W	1.5	250	3	0.067			6					Steel, hail			17
	18	29.580	46.8	29.540	49.3	47.1	35.0	114.2	27.4	42.2	39.0	39.3	37.4	W	1.5	W	1	250	1	0.020			8					Hail			18
	19	29.490	46.4	29.478	48.8	48.8	35.1	123.8	26.4	43.6	40.1	40.1	38.6	W	1	SW	0.5	185	2	0.080			11					Th. 4-5 Am. Heavy hail 1 P.M. Th. 4-5 P.M.			19
	20	29.436	47.2	29.560	51.8	55.1	34.0	127.7	27.0	47.6	43.7	45.4	44.9	SW	1.5	SW	0.5	125	5	0.110			8					Th. 1-2 P.M. - hail			20
	21	29.582	49.3	29.624	51.3	53.2	35.6	114.0	24.8	48.1	45.8	42.8	41.7	SE	1	W	0.5	125	3	0.033			7								21
	22	29.624	49.6	29.646	51.0	57.0	41.3	98.7	29.7	45.7	44.0	45.7	44.7	W	1	SW	0.5	30	5	0.070			5								22
	23	29.652	50.0	29.710	51.2	49.0	42.1	105.0	35.3	46.8	44.8	43.3	42.7	W	0.5	W	0.5	25	6	0.247			2								23
	24	29.798	49.7	29.862	52.4	52.0	39.8	118.9	31.6	47.0	44.8	47.9	46.9	W	0.5	W	0.5	10	1	0.023			3								24
	25	29.860	52.6	30.016	57.0	61.6	43.1	126.5	32.0	55.3	52.2	53.6	52.3	SW	0.5	W	0.5	25	1	0.010			2								25
	26	30.072	55.6	30.048	59.3	67.0	50.1	127.8	37.9	58.2	55.0	57.8	53.4	SW	1	SW	0.5	25	0 1/2	0.003			8								26
	27	30.112	57.6	30.108	58.2	58.6	49.8	135.6	38.6	53.8	51.8	50.9	49.1	W	1	SE	1	75	0	0			9								27
	28	29.992	56.7	29.876	58.8	61.0	43.8	117.4	33.3	52.0	50.0	54.5	51.0	SW	0.5	SW	0.5	60	2	0.010			5								28
	29	29.656	57.4	29.656	58.8	61.7	49.2	95.5	46.7	53.3	53.7	54.3	51.1	SW	1.5	SW	0.5	150	2	0.010			4								29
	30	29.720	56.9	29.684	57.6	57.9	47.8	129.0	42.3	52.0	49.3	50.7	47.6	SW	1.5	SW	0.5	175	0 1/2	0.003			7								30
	31	29.692	56.2	29.766	55.2	57.8	40.6	129.3	38.3	51.8	47.9	44.8	44.0	SW	1	W	0.5	250	4	0.430			8					Hail			31
Sums.		220.214 (27)	1600.4 (5)	29068.8 (21)	16458 (9)	16726 (12)	13116 (7)	34953 (160)	10904 (132)	15096 (97)	14371 (92)	14541 (141)	14004 (145)	360 (26)	225 (19)	3840 (21)	121 (16)	3760 (14)					236 (7)	156 (8)							
Means.		29.6843	51.6	29.6996	53.09	53.96	42.31	112.73	35.17	48.7	46.36	46.91	45.17	1.12	0.73	123.9	3.9	0.121					7.6	8							
† Total Corrections for Instrumental Errors.		-0.013	-	-0.013	-	+0.2	+0.1	0	-0.2	0	0	0	0																		
† Corrections for Diurnal Range.																															
"Corrected Means."		29.671	51.6	29.687	53.1	54.2	42.4	112.8	35.0	48.7	46.4	46.9	45.2	1.1	0.7	124	3.9	0.121					7.6	8							
No. of Column		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

NOTATION USED IN GENERAL REMARKS.					
a.	denotes aurora.	m.	denotes meteor.		
ci.	" cirrus.	ma.	" meteors.		
ci-cu.	" cirro-cumulus.	u.	" umbra.		
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.	sh.	" sheet.		
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.		
l. cl.	" light clouds.	t. s.	" thunder storm.		
li. sh.	" light showers.	w.	" wind.		
lu. co.	" lunar corona.	g.	" gale of wind.		
lu. ha.	" lunar halo.				

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.671  
for Temp. (Col. 2), = 29.671 - 0.006 = 29.665

"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.671  
for Temp. (Col. 4), = 29.671 - 0.006 = 29.665

Mean at Station, corrected, and at 32°, = 29.616 29.719  
Correction for height, 195½ feet above Mean Sea-level, = 29.0215 + 0.112

Mean, reduced to 32°, and Sea-level, = 29.831 29.831

× Highest Reading, corrected for Index error, on the 10 th, = 30.147 30.250  
Lowest Do. Do., on the 4 th, = 28.847 28.950

Difference, or Monthly Range, = 1.300 1.300

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

† Enlarging 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.

§ Write the Diurnal Range is unknown, the Arithmetic Mean of Cols. 3 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 26 th, = 67.2

Lowest in Month, corrected for Index errors, on the 20 th, = 34.1

Difference, or Monthly Range, = 33.1

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

"Corrected Mean" of all the Lowest, (Col. 6), = 42.4

Difference, or Mean Daily Range, = 11.8

\*\* Calculated Mean Temperature of Month, = 48.3

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 5 th, = 136.0

"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 112.8

Lowest at Night, Black Bulb, (corrected for Index errors), on the 21 st, = 24.6

"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 77.8350

Difference of above Means or Range ("exposed"), = 77.8

Evaporation = 2.280 Inches

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 47.8

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 45.8

†† Computed Temperature of Dew-Point, = 43.6

† Do. Elastic Force of Vapour, = 0.285 in.

† Do. Weight of Vapour in a Cubic Foot of Air, = 3.20 grs.

† Relative Humidity, (Saturation = 100), = 86.8

RAIN fell on 29 Days; Amount in Inches, = 3.760 in.

WIND.												SUMMARY.		
Direction.	N	NE	E	SE	S	SW	W	NW	Caln or Variable.	Mean Force.	Mean Velocity in miles per day.			
A.M.	5	3	0	4	2	9	0	6	2	1.12				
P.M.	5	4	0	1	1	9	1	7	2	0.73				
Mean.	5	4	0	3	1	9	1	6	2	0.92	0.85			

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

Observations made and Return verified by { Alex. Beverley, assisted by, Lang. Spruell  
Janitor Grammar School

(Signed) Alex. Beverley

Greatest daily range = 21.2 on the 20th.



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 *Aneroïds*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. No can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-bulbs* are not the 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 *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 *serve up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good *shade*, 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 *ascension* adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index;—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

**Protection of Thermometers.**—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and floors of the Boxes are arranged so as at once to protect the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, Negretti and Zambra's Patent "Meteorium" 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 "Meteorium." 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 top of the tube, and must be disfigured from there by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These statements should be hung horizontally.

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

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

**Registration of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are *not graduated* on the stem, but merely on an attached scale, undepo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "Minimum" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freeing-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. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed, evaporation will proceed as from the moist cloth in ordinary circumstances.

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

**Reading of the Thermometers.**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite to the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus, the Thermometer will be read—39.9, 40.0, or 40.1; or again, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40½°, and 40¾°, more or less must be registered 40.2 or 40.3, and 40.7 or 40.8 respectively. In registered Rutherford's "Max." and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus being unable to judge of their amount, we ought not to take them into account in the *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," 6, S. W., (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{4}$ , ca-st., (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

**Sunshine.**—The number of hours in which objects in the sun's rays cast shadows, should be entered in the *pey* or 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 pier 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, judging 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.

**One.**—Mention whether Schombert's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3½, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as 3½ on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4½," 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 unfortunately so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich, and Southampton, are given at the foot of the column.

Besides special and extraordinary observations, great differences ought to be given in this column to prevent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds; the colour of the sky, &c. Remarks ought to be made on the occurrence of mists, mists, mists, mists, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

The Council recommend that *term day* observations be taken; viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

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

(By Order) A. B.

Edinburgh, 10th November 1850.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

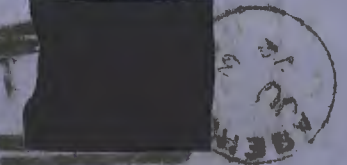
SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry, . . . . .		Apple, . . . . .			Cuckoo, . . . . .		
Bontree or Elder, . . . . .		Black Currant, . . . . .			Curlew, . . . . .		
Broom, . . . . .		Cherry, . . . . .			House-Swallow,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

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

EDINBURGH

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

MR ALEXANDER BUCHAN,



BOOK-POST.



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Leafield Cottage, Kishilaw, Aberdeen*, County of *Aberdeen*, in Lat.  $57^{\circ}8'6''$ , Long.  $2^{\circ}3'16''$ , Distance from Sea  $(2.87=) 3$  miles.  
Height of Cistern of the Barometer above Mean Sea-level  $195\frac{1}{2}$  feet, above Ground  $4\frac{1}{2}$  feet. During the MONTH of *June* 187 *7*.  
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	B.A. BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.  As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.				
		9 h. A.M.		9 h. P.M.		Protected in Shade, at 9 P.M.		Exposed Black Bulb.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.										
		Barometer. No. 2236	Attach- ed Ther- mometer	Barometer. No. 2236	Attach- ed Ther- mometer	Max. No. 7333	Min. No. 7333	Max. in Sun-rays No. 7317	Min. on Grass. No. 7349	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	9 h. A.M.	Amount in inches. No. 2233	No. of hours in which it fell.	Velocity (4-6) and Direction.	Amount (0-10), and Species.	Velocity (4-6) and Direction.	Mean Amount (0-10), and Species. Hourly	No. 1 inches.	No. 2 inches.					No. 3 inches.	Temperature of WELL, at depth of feet No.	Temperature at 1 fathom, and Density.	9 A.M. 9 P.M.
		inches.	°	inches.	°																													
	1	29.880	53.2	29.748	55.2	55.0	40.9	133.9	28.6	49.8	45.9	48.5	46.7	Bar	0.5	SW	0.5	115	5	0.060											1			
	2	29.520	53.9	29.576	56.7	58.4	46.4	111.3	42.0	48.9	48.6	50.7	50.2	SW	1	SW	0.5	355	1	0.007											2			
	3	29.528	56.2	29.632	57.8	59.8	47.2	135.0	36.3	55.6	52.1	50.0	47.9	SW	1	Bar	0.5	30	1	0.005											3			
	4	29.836	55.2	29.900	57.3	58.0	44.2	134.0	31.6	53.9	49.8	51.0	49.0	W	0.5	S	0.5	150	6	0.093											4			
	5	29.826	56.3	29.720	57.0	55.6	48.6	86.7	35.2	51.8	51.4	51.0	50.8	S	1	Bar	0.5	130	10	0.245											5			
	6	29.746	55.4	29.658	57.0	57.1	45.9	132.3	33.2	54.1	52.7	50.9	50.9	S	1	SE	1	75	1	0.010											6			
	7	29.524	56.6	29.266	56.8	53.9	49.1	75.3	48.6	52.2	50.7	50.0	50.0	S	0.5	SW	0.5	65	16	0.570											7			
	8	29.398	54.1	29.352	55.0	57.2	42.4	115.0	34.6	49.9	47.7	50.0	49.4	SE	0.5	SE	1	80	7	0.290											8			
	9	29.248	54.9	29.210	56.6	56.0	47.2	128.5	44.4	52.7	50.7	50.7	50.4	SW	1.5	SE	0.5	175	1	0.007											9			
	10	29.212	53.7	29.258	56.3	54.0	48.9	99.6	48.6	51.9	51.1	50.0	49.4	SE	1.5	Bar	0.5	120	6	0.153											10			
	11	29.294	53.3	29.372	57.0	58.0	46.9	114.8	37.8	53.0	52.0	52.9	51.0	S	1	W	0.5	75	4	0.087											11			
	12	29.494	55.8	29.574	58.0	60.4	47.8	140.2	38.2	53.6	51.7	53.7	52.6	W	1	SW	0.5	75	3	0.050											12			
	13	29.654	57.0	29.838	59.3	60.5	50.2	119.8	43.0	53.8	52.7	52.3	53.0	W	0.5	S	0.5	30	1	0.008											13			
	14	29.860	59.2	29.876	60.8	66.3	52.4	129.4	48.3	58.9	57.6	56.1	55.0	S	1	SW	0.5	50	2	0.035											14			
	15	29.886	59.9	29.980	61.0	63.0	52.4	93.5	41.8	58.0	56.2	59.1	58.0	SW	1	S	0.5	150	2	0.017											15			
	16	30.092	61.0	30.108	62.7	67.7	56.3	143.4	46.9	62.6	60.6	58.0	57.4	SE	0.5	SW	0.5	115	1	0.007											16			
	17	30.056	61.4	29.954	63.0	64.3	53.3	113.2	42.7	59.3	58.9	60.0	59.1	SE	0.5	S	0.5	30	5	0.090											17			
	18	29.868	62.5	29.790	62.8	69.3	53.3	124.0	43.3	62.8	61.9	58.0	57.0	S	0.5	SE	0.5	30	2	0.007											18			
	19	29.790	61.7	29.770	61.8	62.0	53.7	123.8	50.1	58.0	56.9	56.4	55.2	S	1.5	S	1	85	7	0.230											19			
	20	29.812	60.6	29.934	62.0	65.1	54.0	134.8	52.0	60.2	58.3	56.8	55.0	W	1	W	0.5	115	1	0.007											20			
	21	29.860	60.8	29.560	60.3	59.6	51.3	120.7	38.3	58.4	56.1	53.1	53.0	W	1	W	1	125	7	0.330											21			
	22	29.372	59.5	29.602	59.7	59.5	49.8	101.8	40.2	56.0	53.7	53.2	50.9	Bar	0.5	W	1.5	100	4	0.187											22			
	23	29.768	57.9	29.832	60.0	64.0	49.3	132.5	39.8	55.7	53.6	52.2	55.2	W	1	SW	0.5	210	3	0.103											23			
	24	29.796	59.3	29.656	60.4	60.2	52.8	126.0	42.3	57.3	53.7	54.9	54.0	S	0.5	SE	1.5	175	8	0.358											24			
	25	29.432	59.4	29.398	60.2	58.5	53.1	81.3	48.3	54.8	54.8	54.2	54.0	SE	0.5	S	0.5	130	13	0.470											25			
	26	29.408	59.0	29.568	59.3	59.4	52.1	115.0	51.0	57.8	54.6	54.3	53.0	W	1	Bar	0.5	75	3	0.020											26			
	27	29.634	57.2	29.594	59.0	61.0	46.3	140.0	33.3	53.6	51.0	53.9	53.0	W	1	SW	0.5	75	10	0.213											27			
	28	29.330	58.0	29.280	58.5	60.6	51.1	119.7	46.6	53.4	53.2	53.7	50.0	SE	1	W	1.5	75	9	0.165											28			
	29	29.588	56.3	29.790	57.7	59.9	48.2	128.9	44.7	53.9	51.6	51.6	50.0	W	2	W	0.5	325	1	0.008											29			
	30	29.794	56.6	29.642	58.9	60.6	45.0	128.7	33.7	55.6	52.9	53.6	52.6	SE	0.5	SE	0.5	175	2	0.010											30			
	31																															31		
Sums.		889.546	1734.9	889.438	1768.1	1824.9	1482.1	3583.1	1245.4	1657.5	1602.7	1610.5	1573.7	26.5	20.0	353.5	142	3.842																
Means.		29.6515	57.8	29.6479	58.94	60.16	49.4	119.44	41.5	53.25	53.42	53.68	52.46	0.89	0.67	117.8	4.7	0.128																
† Total Corrections for Instrumental Errors.		-0.013		-0.013		+0.2	+0.1	0	-0.2	-0.1	-0.1	-0.1	0																					
‡ Corrections for Diurnal Range.																																		
“Corrected Means.”		29.639	57.8	29.635	58.9	60.4	49.5	119.4	41.3	53.2	53.3	53.6	52.5	0.9	0.7	118	4.7	0.128																
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			

NOTATION USED IN GENERAL REMARKS.					
a.	denotes aurora.	m.	denotes meteor.		
ci.	cirrus.	ms.	meteors.		
ci-cu	cirro-cumulus.	n.	nimbus.		
ci-s.	cirro-stratus.	r.	rain.		
cu.	cumulus.	h.r.	heavy rain.		
cu-s.	cumulo-stratus.	c. h. r.	confined 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.	hall.	squ.	squale.		
li.	lightning.	t.	thunder.		
li-cl.	light clouds.	t.s.	thunder storm.		
li.sh.	light showers.	w.	wind.		
lu.co.	lunar corona.	gc.	gale of wind.		
lu.ha.	lunar halo.				

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

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† for Temp. (Col. 2), =  $29.639$  *Reduced to level of Gram. School*  
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), =  $29.635$   
Mean at Station, corrected, and at 32°, =  $29.558$   $29.657$   
Correction for height,  $195\frac{1}{2}$  feet above Mean Sea-level, =  $+0.212$   $+0.113$   
Mean, reduced to 32°, and Sea-level, =  $29.770$   $29.770$   
Highest Reading, corrected for Index error, on the 16 th, =  $30.195$   
Lowest Do. Do. on the 9 th, =  $29.197$   $29.299$   
Difference, or Monthly Range, =  $0.898$   $0.896$

\* 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.  
† Enlarging corrections for both capillarity and Index Errors.  
‡ The Diurnal Range for Scotland is as yet unknown.  
†† The “Corrected Mean” is calculated from Glaisher’s Hygrometrical Tables, Second Edition only.  
‡‡ While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 5 and 6 will be entered as the “Calculated Mean Temperature.” Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See page.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 18 th, =  $69.5$   
Lowest in Month, corrected for Index errors, on the 1 th, =  $41.0$   
Difference, or Monthly Range, =  $28.5$   
“Corrected Mean” of all the Highest, (Col. 5), =  $60.4$   
“Corrected Mean” of all the Lowest, (Col. 6), =  $49.5$   
Difference, or Mean Daily Range, =  $10.9$   
\*\* Calculated Mean Temperature of Month, =  $54.9$   
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 16 th, =  $143.4$   
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, =  $119.4$   
Lowest at Night, Black Bulb, (corrected for Index errors), on the 1 th, =  $28.4$   
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, =  $41.3$   
Difference of above Means or Range (“exposed”), =  $78.1$

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), =  $54.4$   
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), =  $52.9$   
† Computed Temperature of Dew-Point, =  $51.4$   
† Do. Elastic Force of Vapour, =  $0.380$  h.  
† Do. Weight of Vapour in a Cubic Foot of Air, =  $4.26$  grs  
† Relative Humidity, (Saturation = 100), =  $84.9$  90  
RAIN fell on 30 Days; Amount in Inches, =  $3.842$   $3.06$   
WIND. SUMMARY.  
Direction. N NE E SE S SW W NW Calm or Variable. Mean Force. Mean Velocity in miles per day.  
A.M. 1 1 0 7 8 4 1 6 2 0.88  
P.M. 0 1 0 6 6 8 1 4 4 0.67  
Mean. 7 1 0 6 7 6 1 5 3 0.78 = 0.61 h.

N.B.—The Sums to be correctly added and the Means deduced. Returns from the “Principal Towns” should be in Edinburgh not later than the 3d; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Pasteued, and Forwarded by Book Post, prepaid.  
Evaporation =  $2.534$  inches

Observations made and Return verified by *Mr. Beverly assisted by Sergeant Shonell, Grammar School Aberdeen.*

(Signed) *Alex. Beverly.*

x actual readings at Grammar School, same days shown  
Highest  $30.191$   
Lowest  $29.311$   
Range  $0.880$

Greatest daily range =  $16.0$  on the 18 th











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

Two moderate-sized Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes by Mr. Aick of London. An excellent Barometer is constructed by the great competence of the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-indices* 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 *sew* up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before 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 inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable doors are also made to open to the south. These Boxes may be had from the opticians.

**Self-registering Thermometers.**—Professor Phillips's and Negretti and Zambra's Patent "Maximum" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Bartholomew 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 temperatures it will be found near the top of the tube, and must be dislodged from there by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least

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

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

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

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

**Reading of the Thermometer.**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and rounded in the tenths. Thus the Thermometer will be read—39.5, 40.0, or 40.1; or again, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40, or 40.5 respectively. So also 41.3, and 40.7, more or less must be registered 40.2 or 40.3, and 40.7 or 40.8 respectively. In reading Ruthven's "Max." and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

**Snowfalls** may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs it must be noted in the "Remarks," and the latter S added 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 noticed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (4a, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is *half covered* by clouds, 5 is entered as the *observation*, and so on.

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

**Sunshine.**—The number of hours in which objects in the sun's rays cast shadows, should be entered in the *prob.* 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 a ways the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

**Temperature of Wells.**—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. **Ozone.** Mention whether Schönbien's or Meffert's papers are used. The paper is affected by a pin to a board in the thermometer box, and these indications 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 *px*, as an *even* entry, as the scheduling will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4 = 4 *1/2*, that it is *blowing fresh*.

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

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

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purposes, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner on the side margin. Additional remarks may be made on the margin of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturists. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. 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 *ten day* observations be taken;—viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

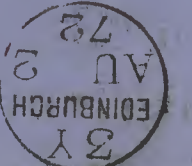
SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry, . . . . .		Apple, . . . . .			Cuckoo, . . . . .		
Bountree or Elder, . . . . .		Black Currant, . . . . .			Curlew, . . . . .		
Broom, . . . . .		Cherry, . . . . .			House-Swallow,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

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

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



Alexander  
July 1872













## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Seafield Cottage, Rubislaw, Aberdeen, County of Aberdeen*in Lat.  $57^{\circ}8'6''N$ , Long.  $2^{\circ}8'46''W$ , Distance from Sea  $(2.87) 3$  miles.Height of Cistern of the Barometer above Mean Sea-level  $195\frac{1}{2}$  feet, above Ground  $4\frac{1}{2}$  feet.During the MONTH of *September* 187 *2*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	13.7. BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No.2237 <i>N.Y.</i>				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.  <i>Mention the hour at which Storms, including Thunder and Lightning, began and ended.</i>		Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected in Shade of Gable-end Ground.		Exposed Black Inlaid Gable-end Ground.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.									
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.2235	Min. No.167	Max. No.2237	Min. No.2232	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity (0-10) and Direction.	Amount (0-10) and Species.	Velocity (0-10) and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of Well at depth of feet 25.						Temperature of Air, Land, and Under- ground.	9 A.M. 9 P.M.
		<i>No.236</i>	<i>No.236</i>	<i>No.236</i>	<i>No.236</i>	<i>No.235</i>	<i>No.167</i>	<i>No.237</i>	<i>No.232</i>																								
		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	29.730	55.3	29.810	55.5	54.3	43.7	93.4	34.4	50.5	47.0	44.7	42.9	hw	15	hw	0.5	210	0	0	7Cs	9							1				
	2	29.838	52.1	29.748	54.4	53.0	38.4	81.5	29.1	49.2	47.6	50.7	50.3	hw	0.5	hw	2	50	16	0.865	9h	3							Fog	2			
	3	29.634	53.3	29.572	58.6	60.3	49.1	104.2	49.0	56.3	56.0	56.6	56.5	hw	0.5	bar	0.5	210	10	0.395	9h	0							Fog. <i>Th &amp; Ln. 12-2 am</i>	3			
	4	29.476	58.0	29.518	60.0	63.0	55.5	85.0	55.1	59.0	59.0	57.9	57.9	bar	0.5	bar	0.5	105	8	0.050	9St	2							Fog. <i>Th &amp; Ln. 830-1030 am</i>	4			
	5	29.538	59.2	29.572	61.2	63.0	55.8	103.8	46.3	58.2	58.2	60.0	59.0	bar	0.5	s	0.5	5	2	0.125	7St	6									5		
	6	29.580	59.1	29.592	61.7	65.5	51.2	97.7	41.0	58.7	57.9	57.4	56.4	s	1	hw	0.5	75	1	0.010	8Cs	8								Th. 5-9 am	6		
	7	29.586	59.9	29.648	59.7	60.0	54.2	100.0	45.4	56.1	55.1	55.2	54.0	hw	1	hw	1	120	1	0.020	10St	0									7		
	8	29.688	58.1	29.686	59.0	59.5	51.7	118.5	47.8	55.7	53.0	55.7	53.0	hw	0.5	bar	0.5	175	0	0	7St	4								Fog	8		
	9	29.534	57.5	29.402	58.9	57.5	49.0	67.9	39.6	54.1	53.2	56.8	55.8	s	1	SE	0.5	25	5	0.125	9St	1								Fog	9		
	10	29.498	56.9	29.520	59.0	63.0	45.7	123.8	33.4	56.7	52.3	54.4	54.0	hw	1	SW	0.5	60	8	0.225	7Cs	7									10		
	11	29.466	58.2	29.498	60.0	60.7	52.8	72.0	46.6	53.9	53.2	58.0	58.0	s	0.5	bar	0.5	150	9	0.230	10h	0									11		
	12	29.674	58.7	29.900	60.2	65.3	53.4	128.0	45.1	58.4	57.9	55.0	54.0	hw	1	hw	0.5	100	5	0.100	5Cs	8									12		
	13	29.916	59.2	29.868	60.0	60.2	53.2	87.5	44.5	56.6	56.0	55.8	54.7	bar	0.5	bar	0.5	55	7	0.177	10h	0								Fog	13		
	14	29.976	57.7	29.870	57.9	59.3	50.3	103.0	40.5	54.0	51.7	54.3	50.5	hw	1	hw	0.5	75	0	0.010	7Cs	5									14		
	15	29.740	56.8	29.770	58.6	60.7	51.2	113.6	47.3	55.8	52.0	56.9	54.7	hw	1.5	hw	1	30	0	0	8Cs	2								Fieldfare first seen	15		
	16	29.652	57.8	29.390	58.9	61.4	52.3	112.6	45.4	55.7	52.3	57.9	56.1	hw	0.5	SW	0.5	100	2	0.013	7Cs	4									16		
	17	29.510	56.2	29.312	56.9	58.8	47.6	108.0	33.4	52.8	49.3	50.8	48.2	SW	1	SW	1	100	1	0.007	7Cs	4								So. ha. 10 am.	17		
	18	29.060	54.0	29.050	54.9	55.8	42.6	100.2	30.2	49.7	47.6	50.0	48.4	SW	1	hw	1.5	100	5	0.110	7Cs	4									18		
	19	29.260	53.0	29.492	53.0	52.8	43.2	80.3	37.9	50.6	48.2	44.3	42.0	hw	1.5	hw	1.5	250	5	0.175	8Cs	4									19		
	20	29.650	50.0	29.556	49.7	48.0	39.8	101.0	30.7	43.1	42.0	41.9	39.7	hw	1.5	hw	1.5	270	4	0.093	7h	7								Hail (snow 1/4 miles west of town)	20		
	21	29.480	48.0	29.608	50.3	49.0	39.8	102.2	30.4	42.7	40.8	43.5	41.0	hw	1.5	hw	2	250	8	0.320	8h	4									21		
	22	29.628	46.9	29.614	46.9	44.9	38.1	93.8	32.7	40.9	39.6	39.0	37.0	hw	2	hw	0.5	350	8	0.420	6h	8								Sheet	22		
	23	29.506	46.0	29.396	47.7	46.7	37.7	59.0	28.1	39.5	39.0	42.7	41.1	h	0.5	hw	1	75	5	0.090	10h	0									23		
	24	29.354	46.4	29.304	48.3	48.0	39.6	81.0	33.5	44.4	42.6	44.9	42.7	hw	1.5	hw	2	100	10	0.810	7h	4										24	
	25	29.212	48.6	29.428	50.3	49.0	43.2	50.0	37.3	48.0	47.7	48.7	48.0	h	3	h	2.5	330	15	2.155	10h	0								(none)	25		
	26	29.350	47.3	29.660	48.0	49.1	39.5	98.0	43.1	47.0	46.0	40.7	39.6	hw	1.5	hw	0.5	750	2	0.015	8Cs	2								Gale with heavy rain, 2 am - 5 pm.	26		
	27	29.370	47.3	28.882	49.9	50.6	38.6	55.3	30.0	44.5	43.6	46.8	44.3	s	0.5	s	1.5	55	5	0.083	8Cs	4									27		
	28	28.800	48.2	29.012	50.3	52.1	40.4	106.0	30.4	48.0	46.1	48.1	46.6	SW	2	hw	1.5	150	2	0.033	7Cs	5									28		
	29	29.258	48.9	29.410	50.4	53.3	42.7	111.2	32.4	47.4	45.3	46.3	44.1	hw	1	hw	1	70	3	0.047	7Cs	7									29		
	30	29.518	47.9	29.498	50.6	51.8	38.8	97.0	28.0	44.8	42.8	47.2	47.0	hw	1	s	0.5	80	12	0.253	7Cs	5									30		
	31																															31	
Sums.		885.632	1611.0	885.392	1650.8	1650.8	1676.3	1379.1	283.55	1148.6	1334.3	1484.0	1522.2	749.5	32.0	29.0	466.5	157.5	6.956		233	117											
Means.		29.5211	53.7	29.5208	53.03	53.03	53.88	44.52	34.82	51.14	49.47	50.74	49.38	1.07	0.97	155.5	5.3	0.2319		7.8	3.9												
Total Corrections for Instrumental Errors.		-0.013	-	-0.013	-	+0.2	+0.1	0	-0.2	0	0	0	0																				
Corrected Means.		29.508	53.7	29.507	53.0	53.1	46.1	94.5	38.1	51.1	49.5	50.7	49.3	1.07	0.97	156	5.3	0.232		7.8	3.9												
No. of Columns.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

NOTATION USED IN GENERAL REMARKS.											
a.	aurora.	m.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
ci.	cirrus.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
ci-cu.	cirro-cumulus.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
ci-s.	cirro-stratus.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
cu.	cumulus.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
cu-s.	cumulo-stratus.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
d.	dew.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
f.	fog.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
fr.	frost.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
h. fr.	hoar-frost.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
h.	haze.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
h. d.	heavy dew.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
h.	hail.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
l.	lightning.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
l. cl.	light clouds.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
l. sh.	light showers.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
lu. co.	lunar corona.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.
lu. ha.	lunar halo.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.	ms.	denotes meteor.

TABLE FOR ESTIMATING FORCE OF WIND.											
Estimated Force.	Common Designation.	Estimated Force.	Common Designation.	Estimated Force.	Common Designation.	Estimated Force.	Common Designation.	Estimated Force.	Common Designation.	Estimated Force.	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard	5	Blowing hard	6	Violent gale	7	Violent gale
0.5	Very light air	2	Fresh breeze	5	Blowing hard	6	Violent gale	7	Violent gale	8	Violent gale
1	Light air	3	Very fresh	6	Violent gale	7	Violent gale	8	Violent gale	9	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction  $\dagger\dagger$  for Temp. (Col. 2), =  $29.442$  *at level of Grammar School*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\dagger\dagger$  for Temp. (Col. 4), =  $29.437$   
Mean at Station, corrected, and at 32°, =  $29.439$   $29.571$   
Correction for height,  $195\frac{1}{2}$  feet above Mean Sea-level, =  $40.214$   $+0.112$   
Mean, reduced to 32°, and Sea-level, =  $29.653$   $29.653$   
Highest Reading, corrected for Index error, on the 14 th, =  $29.963$   $30.064$   
Lowest Do. Do. on the 28 th, =  $28.787$   $28.890$   
Difference, or Monthly Range, =  $1.176$   $1.174$

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6 th, =  $65.7$   
Lowest in Month, corrected for Index errors, on the 23 th, =  $37.8$   
Difference, or Monthly Range, =  $27.9$   
"Corrected Mean" of all the Highest, (Col. 5), =  $56.1$   
"Corrected Mean" of all the Lowest, (Col. 6), =  $46.1$   
Difference, or Mean Daily Range, =  $10.0$   
\*\* Calculated Mean Temperature of Month, =  $51.1$   
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 12 th, =  $128.0$   
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  $94.5$   
Lowest at Night, Black Bulb, (corrected for Index errors), on the 30 th, =  $27.8$   
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, =  $38.1$   
Difference of above Means or Range ("exposed"), =  $86.4$

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), =  $50.9$   
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), =  $49.4$   
†† Computed Temperature of Dew-Point, =  $47.8$   
†† Do. Elastic Force of Vapour, =  $0.334$  in.  
†† Do. Weight of Vapour in a Cubic Foot of Air, =  $3.74$  grs.  
†† Relative Humidity, (Saturation = 100), =  $89.5$   
RAIN fell on 27 Days; Amount in Inches, =  $6.956$  *Round Sheet*

WIND.										SUMMARY.			
Direction.	N	NE	E	SE	S	SW	W	NW	Calcu or Variable.	Mean Force.	Mean Velocity in miles per day.		
A.M.	3	1	0	0	4	3	4	12	3	1.07			
P.M.	2	3	0	1	3	3	1	12	5	0.97			
Mean.	3	2	0	0	4	3	2	12	4	1.07	= 1.04 <i>CB</i>		



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 shaker 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 completeness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

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

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

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

An excellent Barometer is constructed by Mr. A. de la Roche, 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, when stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to *form one straight line* with those on its ivory frame, the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *aneroid*.

When a Barometer, having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *screw up* 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 *style*, 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 *adjustment* carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index;—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

**Protection of Thermometers.**—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended, on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, Messrs. J. & J. Roberts, 11, Abchurch Lane, London, E.C. 4.

**Self-registering Thermometers.**—Professor Phillips, 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 Katherford 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 shaking the instrument repeatedly against the palm of the hand; if when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be discoloured from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

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

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

**Reading of the Thermometers.**—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 30° 9, 40° 0, or 40° 1;—again, 40° 4, 40° 5, or 40° 6, according as it indicates a half, under an exact coincidence with or little over 40° or 40° 1;—respectively. So also 40° 1, 40° 2, and 40° 3, more or less must be registered. Ruthven's "Juno" and "Juno" 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 Thermometer is read at 9 a.m. and 9 p.m. The self-registering Thermometers are read at 9 p.m. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 2d are those of a series of phenomena commencing at 9 p.m. on the 2d, and extending till 9 p.m. on the 3d.

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

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

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

**Rain-gauges.**—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavorable situations 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 round its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

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

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

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

Observations of the clouds are made at 9 a.m. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2 W. (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W. and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{4}$ , (e.g.) will indicate that the higher regions are covered to the "amount" of 4 tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2 tenths by lower clouds of the *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 anti-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 out of the water noted. **Crops.**—Mention whether Schimper's or Metcalf's papers are used. If the paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—Thus 5-1-3, as an *exemplary* 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 is "5," i.e., that it is *blowing fresh*.

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

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

Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms as well as 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 small off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side-marginal. Additional remarks may be made on the state of the seasons, possess not only green scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term day* observations be taken;—viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

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

EDINBURGH. (By Order) A. B.

EDINBURGH.

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

MR ALEXANDER BUCHAN,



OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Out or Raised.	MIGRATORY BIRDS.	First Arrival.	Departure.
Alder, . . . . .					Barley, . . . . .					Cuckoo, . . . . .		
Ash, . . . . .					Bere or Bigg, . . . . .					Curlew, . . . . .		
Beech, . . . . .					Oats, . . . . .					House-Swallow, . . . . .		
Birch, . . . . .					Wheat, . . . . .					Lapwing, . . . . .		
Elm, . . . . .					Beans, . . . . .					Plover, . . . . .		
Larch, . . . . .					Pense, . . . . .					Sand-Martin, . . . . .		
Lime, . . . . .					Potatoes, . . . . .					Starling, . . . . .		
Oak, . . . . .					Turnips, . . . . .					Swan, . . . . .		
Sycamore or Plane, . . . . .					Rye Grass, . . . . .					Rail or Corn Crane, . . . . .		

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.
Barberry, . . . . .		Apple, . . . . .		
Bourtree or Elder, . . . . .		Black Currant, . . . . .		
Broom, . . . . .		Cherry, . . . . .		
Hazel, . . . . .		Gean, . . . . .		
Hawthorn, . . . . .		Gooseberry, . . . . .		
Holly, . . . . .		Peach, . . . . .		
Laburnum, . . . . .		Pear, . . . . .		
Lilac, . . . . .		Plum, . . . . .		
Mezereon, . . . . .		Strawberry, . . . . .		
Mountain Ash or Rowan, . . . . .				
Red Flowering Currant, . . . . .				
Rhododendron Ponticum, . . . . .				
Whin, . . . . .				

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



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Scarfild Cottage, Rubislaw, Aberdeen County of Aberdeen, in Lat. 57° 8' N, Long. 2° 46' W. Distance from Sea (287-1) 3 miles.Height of Cistern of the Barometer above Mean Sea-level 195½ feet, above Ground 4½ feet.During the MONTH of October 1872.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	B.S. BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.  As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer. Prevalent Diseases, etc.  Mention the hour at which Storms, including Thunder and Lightning, began and ended.		Days of Month.				
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulb.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H. Cup Anemometer.		No. of Amount in which fell.		9 A.M.		P.M.		9 h. A.M.									
		Barometer. * No. 236	Attach- ed Ther- mometer	Barometer. No. 236	Attach- ed Ther- mometer	Max. No. 353	Min. No. 107	Max. in Sun's rays No. 217	Min. on Grass. No. 245	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Direction.	Amount (0-10), and Species.	Direction.	Amount (0-10), and Species.	Direction.	Amount (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.						Temperature of Wells at depth of feet. No.	Temperature at 1 fathom, and Density.	9 A.M.	9 P.M.
		inches.		inches.																															
	1	29.234	51.0	29.130	54.0	57.0	46.1	67.0	43.2	50.7	50.6	53.7	52.6	S	1	SW	2	30	4	0.033											si. l.	1			
	2	29.002	53.8	29.008	54.0	57.2	49.0	67.0	47.4	53.7	53.1	50.6	48.7	SW	15	SW	15	130	1	0.010													2		
	3	28.480	52.8	29.272	49.5	51.3	37.3	48.0	37.9	50.6	48.6	38.0	35.3	W	15	W	15	20	1	0.010													3		
	4	29.596	46.9	29.490	47.5	45.2	36.4	102.0	28.0	42.0	39.0	38.8	37.2	W	2	W	15	210	1	0.010													4		
	5	30.157	45.0	30.088	45.1	46.3	34.8	99.7	24.4	39.4	37.7	38.6	36.9	W	0.5	SW	0.5	175	0.5	0.005													5		
	6	29.474	44.8	29.830	48.0	52.3	36.5	99.6	25.6	42.0	40.0	47.8	45.0	SW	0.5	SW	1.5	110	8	0.397													6		
	7	29.674	49.6	29.768	50.4	54.8	42.8	71.4	40.3	51.8	51.6	43.5	42.7	S	0.5	SW	0.5	275	3	0.020													7		
	8	29.618	48.8	29.488	51.0	54.6	39.7	95.8	29.4	47.6	46.2	48.0	46.9	SW	0.5	SW	1.5	30	1	0.010													8		
	9	29.368	49.8	29.360	50.0	52.3	41.0	102.2	37.8	48.2	46.4	42.0	39.7	SW	1	W	0.5	150	0.5	0.005													9		
	10	29.302	46.7	29.198	48.4	47.6	36.0	88.4	23.8	40.8	39.6	43.0	41.6	W	0.5	S	1	75	6	0.115													10		
	11	29.122	47.6	29.130	47.3	47.0	41.0	52.0	34.1	44.3	42.6	43.1	42.6	W	2	W	4	150	18	1.060														11	
	12	29.282	47.2	29.438	48.4	47.0	42.0	57.7	39.4	45.7	44.3	44.7	43.6	W	2	W	2	470	12	0.260														12	
	13	29.490	47.3	29.752	48.0	48.9	41.4	87.5	38.3	43.5	43.0	42.0	42.0	W	15	W	0.5	150	4	0.067														13	
	14	29.874	46.2	29.804	47.6	49.0	36.6	90.5	27.4	41.9	41.9	43.8	43.3	W	1	S	0.5	475	1	0.010														14	
	15	29.650	46.0	29.360	47.3	48.2	36.0	84.0	25.3	41.7	41.0	41.3	40.9	S	0.5	W	0.5	0	0.005															15	
	16	29.258	46.6	29.540	48.3	49.0	40.4	94.9	30.2	43.7	42.3	41.3	40.9	SW	0.5	W	0.5	25	1	0.010														16	
	17	29.698	46.6	29.814	48.0	49.3	38.7	88.0	29.6	43.0	42.6	41.3	41.0	W	0.5	W	0.5	100	1	0.010														17	
	18	29.806	46.9	29.696	49.7	50.9	40.3	82.2	30.7	44.7	44.5	50.0	49.9	W	1	W	1	50	6	0.123														18	
	19	29.544	50.3	29.530	51.7	52.0	47.8	85.0	45.0	49.5	48.7	50.0	49.1	SW	1	SW	1.5	20	1	0.007														19	
	20	29.512	50.7	29.576	51.9	52.4	43.7	87.8	37.1	46.6	45.7	47.3	46.7	SW	1	SW	1	25	6	0.230														20	
	21	29.502	50.9	29.302	51.0	48.3	44.7	51.3	36.3	45.4	45.7	47.0	46.3	W	0.5	W	2	15	18	0.650														21	
	22	29.120	48.9	29.264	49.2	47.4	42.0	49.9	41.4	43.4	42.3	44.0	43.6	W	15	S	0.5	200	10	0.083														22	
	23	29.350	48.6	29.257	49.2	49.1	43.0	62.3	40.4	45.4	43.7	44.9	43.6	W	1	SW	0.5	10	6	0.045														23	
	24	29.018	48.9	29.078	51.0	49.9	43.9	51.0	36.6	46.9	46.2	48.5	49.0	S	15	SW	2	20	13	0.510														24	
	25	29.106	51.4	29.274	52.0	51.3	46.9	80.0	45.1	50.6	50.0	48.0	47.6	S	2	SW	1.5	80	4	0.037														25	
	26	29.280	51.7	29.300	52.8	50.8	46.7	67.0	42.0	50.0	49.7	49.0	48.8	SE	1	SE	1	50	8	0.575														26	
	27	29.380	52.4	29.488	53.0	51.9	46.6	67.0	41.7	49.8	49.6	48.0	48.0	S	0.5	S	0.5	50	4	0.050														27	
	28	29.558	50.3	29.576	50.3	49.2	40.6	80.3	30.9	43.0	42.6	43.3	42.1	W	0.5	SE	0.5	10	2	0.010														28	
	29	29.448	49.9	29.108	52.6	52.2	41.3	62.8	30.7	49.2	48.0	52.3	52.9	SW	1.5	SW	1.5	40	2	0.015														29	
	30	28.958	49.6	28.894	48.4	54.6	40.2	69.2	34.8	42.8	40.6	41.3	39.2	SW	1.5	W	1.5	210	1	0.010														30	
	31	28.902	46.8	29.096	48.0	49.0	39.0	80.0	35.0	45.7	41.4	41.0	38.3	W	2.5	SW	1.5	250	0	0														31	
	Sums.	911.756	154.0	912.406	154.6	1568.0	1282.2	2494.0	1089.7	1424.1	1389.2	1399.1	1366.0	345	370	3605	144	4.382		199	147														
	Means.	29.412	48.8	29.432	49.8	50.6	41.3	79.16	35.25	45.94	44.81	45.13	44.06	1.11	1.19	116	4.6	0.141		6.4	4.7														
	† Total Corrections for Instru- mental Errors.	-0.013	-	-0.013	-	+0.2	+0.1	0	-0.2	0	0	0	0	0.6	0.6																				
	† Corrections for Diurnal Range.																																		
	"Corrected Means."	29.399	48.8	29.420	49.8	50.8	41.5	79.2	35.0	45.9	44.8	45.1	44.1	1.11	1.19	116	4.6	0.141		6.4	4.7														
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.345  
for Temp. (Col. 2), = 2.9.3.9.9. - 0.032. }  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.363  
for Temp. (Col. 4), = 2.9.4.2.0. - 0.037. }  
Mean at Station, corrected, and at 32° = 29.354 29.457  
Correction for height, 195½ feet above Mean Sea-level, = +0.216 +0.113  
Mean, reduced to 32°, and Sea-level, = 29.570 29.570  
Highest Reading, corrected for Index error, on the 5 th, = 30.137 30.251  
Lowest Do. Do., on the 30 th, = 28.881 28.995  
Difference, or Monthly Range, = 1.256 1.256

\* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.  
† Embracing corrections for both capillarity and Index Errors.  
†† The Diurnal Range for Scotland is as yet unknown.  
‡ Practically, though not absolutely a minus correction.  
§ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition only.  
|| While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 6 and 7 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 2 th, = 57.4  
Lowest in Month, corrected for Index errors, on the 3 th, = 34.9  
Difference, or Monthly Range, = 22.5  
"Corrected Mean" of all the Highest, (Col. 5), = 30.8  
"Corrected Mean" of all the Lowest, (Col. 6), = 41.5  
Difference, or Mean Daily Range, = 9.3  
\*\* Calculated Mean Temperature of Month, = 46.2  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 9 th, = 102.2  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 79.2  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 10 th, = 23.6  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 35.0  
Difference of above Means or Range ("exposed"), = 46.2  
Evaporation = 1.102 in.

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 45.5  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 44.4  
†† Computed Temperature of Dew-Point, = 43.1  
†† Do. Elastic Force of Vapour, = 0.279 in.  
†† Do. Weight of Vapour in a Cubic Foot of Air, = 3.17 grs.  
†† Relative Humidity, (Saturation = 100), = 92.7  
RAIN fell on 30 Days; Amount in Inches, Rose & Bevel = 4.382

WIND.												SUMMARY.		
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.			
A.M.	0	1	0	1	6	9	4	10	0	1.11				
P.M.	0	3	0	2	4	13	1	7	1	1.19				
Mean.	0	2	0	2	5	11	2	8	1	1.15	1.32			

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

Observations made and Return verified by { Alexander Beverley, Assisted by Sergeant Spruce, Grammar School

Actual readings at Grammar School, same days & hours.  
Highest 30.253  
Lowest 28.997  
Diff. 1.256

Greatest daily range 15.8° on the 6th  
(Signed) Alex. Beverley  
N.B. His copy of this note containing Anemometer readings is in Col. 17. The readings are quite defective.



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

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

**Barometrical.**—*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. No can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

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

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

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

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

**Self-registering Thermometers.**—Professor Phillips's, and Negretti and Zambra's Patent "Maximum" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "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 dangers, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube and must be diluted from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid.

These instruments should be hung horizontally.

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

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

**Position of Hygrometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Hygrometer*. 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. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *long* down by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the manin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the manin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much difficulty and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

**Reading of the Thermometers.**—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—38.9, 40.0, or 40.1; or again, 40.2, 40.3, or 40.4, according as it indicates a little under, an exact centavo, or a little over 40°, or 40½°, respectively. So also 40½°, and 40¾°, more or less must be registered 40.2 or 40.3, and 40.7 or 40.8 respectively. In reading Rutherford's "Max" and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

**Hour of observing Temperature.**—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 8d. are those of a series of phenomena commencing at 9 P.M. on the 7d. and extending till 9 P.M. on the 3d.

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

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

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

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

**Snow-fall 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 registered *separately* only, and nothing that partakes of the nature of deduction or inference.

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

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *cloud* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered 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," S. W. (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{4}$ , (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *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 Selwyn's or Mohr's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3.1, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as 3.1 on the scale, that the wind is from the N.W., and that its force on the scale 0–6 is 4.4; 4.2, that it is *blowing fresh*.

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

**Remarks.**—The "Remarks" column is too narrow, but unavoidable. 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, storms, and remarkable falls of snow, hail, or rain, the hour of storms or of wind attaining their maximum, as well as such notes on storms as have been entered at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the storm line in which 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 side-margin.

Observations in connection with the periodic return of the seasons' passes 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 reaped from year to year on a selected piece of ground or farm.

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

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

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

EDINBURGH, 19th November 1852.

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

EDINBURGH.

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

MR ALEXANDER BUCHAN,

To





SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Seafield Cottage, Rubislaw, Aberdeen, County of Aberdeen

, in Lat. 57° 6' N, Long. 28° 46' W, Distance from Sea 2 miles.

Height of Cistern of the Barometer above Mean Sea-level  $195\frac{1}{3}$  feet, above Ground  $4\frac{1}{5}$  feet.

During the MONTH of November 1872.

The Hours of Observation are of Greenwich Time.

[illegible]

<b>BAROMETER,</b> "corrected Mean" at 9 A.M., <i>minus</i> the Correction $\uparrow \uparrow$		= 29.313	<i>Rev new</i>
for Temp. (Col. 2), = <u>29.358</u> ... - 0.045			<i>to level</i>
"Corrected Mean" of Barometer at 9 P.M., <i>minus</i> the Correction $\uparrow \uparrow$		= 29.297	<i>to datum</i>
for Temp. (Col. 4), = <u>29.344</u> ... - 0.047			<i>school</i>
<b>Mean at Station, corrected, and at 32°,</b> .....		= 29.305	29.608
Correction for height, $195\frac{1}{2}$ feet above Mean Sea-level,.....		= +0.217	+0.114
<b>Mean, reduced to 32°, and Sea-level,</b> .....		= 29.522	29.622
Highest Reading, corrected for Index error, on the 13 th,.....		= 30.269	30.376
Lowest Do. Do., on the 23 th,.....		= 28.487	28.590
Difference, or <b>Monthly Range,</b> .....		= 1.782	1.783

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6<sup>th</sup>, ..... = 60.8

Lowest in Month, corrected for Index errors, on the 29th, ..... = 29.7

"Corrected Mean" of all the Highest, (Col. 5), ..... = 46.2

"Corrected Mean" of all the Lowest, (Col. 6), ..... = 37.1

Difference, or **Mean Daily Range**, ..... = 9.1

\*\* Calculated **Mean Temperature of Month** ..... = 41.7

R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors); on the 4<sup>th</sup>,..... = 89.0

"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun,..... = 59.8

**Lowest at Night**, Black Bulb, (corrected for Index errors), on the 28<sup>th</sup>, ... = 19.0

“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, ..... = 31.2  
 Difference of above Means or Range (“exposed”), ..... = 28.6

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

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

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

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

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

## Relative Humidity, (Saturation = 100), ..... =

RAIN fell on 26 Days; Amount in Inches, *even. 1.25* =

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	2	3	0	6	3	9	3	4	0	1.2	
P.M.	4	4	0	4	4	9	3	2	0	1.2	
Mean.	3	4	0	5	3	9	3	3	0	1.2	1.446

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

Embracing corrections for both capillarity and index errors.

The Diurnal Range for Scotland is yet unknown.

*Practically, though not absolutely a minor correction.*

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

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

Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

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

Evaporation = 0.981 inches

Observations made and  
Return verified by } Mrs Beverly assisted by Serg. Howell  
Sanitar Grammar School Aberdeen

(Signed) My. Beverly

Greatest daily range 17.4 on the 14<sup>th</sup>





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 considerably as to render them quite incomparably, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire 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. Ait of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-indices* are not true inches but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their convenience being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-pool is brought, by the adjusting screw, to *join one straight line with those on its ivory frame*, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary setting* must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *serve up* the mercury to within a quarter of an inch of the top of the tube and take down the instrument; it may then be carried with the cistern 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 *style*, 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 glass will greatly facilitate an accurate adjustment and reading of the Barometer.

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

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

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "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-dump 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 man must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the man 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 an iron case, which also supports the water-dump underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the iron case, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

**Reading of the Thermometer.**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index, or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.9, 40.0, or 40.1; or, regally, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40½°, and 40½°, more or less must be registered 40.2 or 40.3, and 40.7 or 40.8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

**Clouds.**—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greatest less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction,"  $\frac{2}{3}$  W. (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{3}$  (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 26th 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 Mollat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3<sup>px</sup>, 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 unfortunately 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 lists of such as are recognized and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of onsets as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

EDINBURGH.

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



MR ALEXANDER BUCHAN,



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Scapill, Colton, Ruthven, Aberdeen, County of Aberdeen*in Lat.  $57^{\circ}8'6''N$ , Long.  $2^{\circ}46'4''W$ , Distance from Sea  $(28\frac{1}{2})$  3 miles.Height of Cistern of the Barometer above Mean Sea-level  $145\frac{1}{2}$  feet, above Ground  $4\frac{1}{2}$  feet.During the MONTH of *December*, 1872.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.  As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs. No. 2232		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
		Barometer. No. 236	At- tached Ther- mometer	Barometer. No. 236	At- tached Ther- mometer	Max. No. 232	Min. No. 107	Max. in Sun's rays No. 237	Min. on Grass. No. 238	Dry bulb. No. 239	Wet bulb. No. 240	Dry bulb. No. 239	Wet bulb. No. 240	Direction. No. 241	Force. No. 242	Direction. No. 243	Force. No. 244	Readings of the H. Cup Anemometer No. 245	No. of hours in which it fell. No. 246	Amount in inches. No. 247	Velocity (0-10), and Species. No. 248	Amount, (0-10), and Species. No. 249	Amount, (0-10), and Species. No. 250	No. 251	No. 252	No. 253					Temperature of WELL at depth of feet. No.	Temperature at 1 fathoms, and Density.	0-10.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction ++ for Temp. (Col. 2), =  $29.261$ "Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), =  $29.267$ Mean at Station, corrected, and at 32°, =  $29.264$   $29.369$ Correction for height,  $145\frac{1}{2}$  feet above Mean Sea-level, =  $+2.19$   $+0.114$ Mean, reduced to 32°, and Sea-level, =  $29.483$   $29.483$ Highest Reading, corrected for Index error, on the 22<sup>nd</sup>, =  $29.789$   $29.894$ Lowest Do. Do. on the 25<sup>th</sup>, =  $28.561$   $28.664$ Difference, or Monthly Range, =  $1.228$   $1.230$ S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 27<sup>th</sup>, =  $48.6$ Lowest in Month, corrected for Index errors, on the 5<sup>th</sup>, =  $25.3$ Difference, or Monthly Range, =  $23.3$ "Corrected Mean" of all the Highest, (Col. 5), =  $42.0$ "Corrected Mean" of all the Lowest, (Col. 6), =  $34.7$ Difference, or Mean Daily Range, =  $7.3$ \*\* Calculated Mean Temperature of Month, =  $38.4$ S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 6<sup>th</sup>, =  $61.2$ "Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  $47.7$ Lowest at Night, Black Bulb, (corrected for Index errors), on the 14<sup>th</sup>, =  $16.0$ "Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, =  $28.3$ Difference of above Means or Range ("exposed"), =  $19.4$ Evaporation =  $0.355$  inches

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

Bulb, (Cols. 9 and 11), =  $38.8$ Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), =  $37.8$ Computed Temperature of Dew-Point, =  $36.5$ Do. Elastic Force of Vapour, =  $0.217$   $1/2$ Do. Weight of Vapour in a Cubic Foot of Air, =  $2.56$   $9/10$ Relative Humidity, (Saturation = 100), =  $93.7$   $4$ RAIN fell on 25 Days; Amount in Inches, =  $3.863$ 

WIND.												SUMMARY.		
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.			
A.M.	2	2	0	7	5	9	3	3	0	1.26				
P.M.	3	2	1	8	5	10	2	3	0	1.21				
Mean.	2	2	1	7	5	9	2	3	0	1.23	1.57			

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

Observations made and Return verified by *Alexander Beveridge, assisted by Sergt. Grinnell*  
*Janitor, Grammar School Aberdeen*x Actual at *Grammar School* same days and hoursHighest  $29.903$   
Lowest  $29.677$   
 $1.226$ Greatest daily range  $14.9$  on the 29<sup>th</sup>  
(Signed)

6



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

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

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

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

Two moderate-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 constructed by Mr. Ait 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 flat, whose stem passes freely through the lid and case of the cistern. When the *index* on this little piston, and 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 *prismatic* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *weather*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *seize* up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern 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 lap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

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

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

**Protection of Thermometers.**—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from any local influences. The tails 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-baths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These boxes may be had from the opticians, 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 *columns of spirit* breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

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

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

**Reading of the Thermometer.**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite to 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 less, an exact coincidence with, or a little over 40°, or 40½°, or 40¾°. So also 40½°, and 40¾°, more or less must be registered 40.2 or 40.3, and 40.7, 40.8 respectively. In reading Richardson's "Glean" 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 Thermometer is read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d. Wind.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the main direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e. within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds column, though their appearance and changes ought to be noted among the "Remarks." The amount of 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 2, east, (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

**Underground Thermometers.**—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. 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 Schloffen's or Moffat's papers are used. The paper is affected by a pin to a board in the thermometer box, and the indications be registered in connection with the force and direction of the wind registered in the observations, in the following manner:—thus 3½, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, 0-6 is "4" & "4", 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, green 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 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, either headed "Remarks," or in two ruled off for the purpose, for that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side margin. Additional remarks may be made on the margin.

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

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

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

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

(By Order) A. B. Ensignment, 20th November 1892.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

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76  
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Daffine 3th  
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Dec 1892

