

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Fetter College, County of Middlethian, in Lat. 55° 57' 45", Long. 3° 13' 20", Distance from Sea 1 1/4 miles.
Height of Cistern of the Barometer above Mean Sea-level 1601.7 feet, above Ground 601.7 feet. During the MONTH of March 1873.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS.		HYGROMETER.		WIND.		RAIN.		CLOUDS.		SUNSHINE.	THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.									
		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.			9 h. A.M.															
		No.	Atmos.	No.	Atmos.	No.	Atmos.	No.	Atmos.	No.	Atmos.	No.	Atmos.		No.	Atmos.	No.					Atmos.								
	1																			1										
	2																			2										
	3																			3										
	4																			4										
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	12																			12										
	13																			13										
	14																			14										
	15																			15										
	16	29.986	49°	29.902	55°					S 8										16										
	17	29.862	50°	29.936	50°					ESE 15										17										
	18	29.968	49.5°	29.946	57°					NE 5										18										
	19	29.986	53°							N 1										19										
	20																			20										
	21																			21										
	22																			22										
	23																			23										
	24					44.335.5		39.539	41 41	N .5										24										
	25					46 38.7		40.1 40	39.5 40	ENE .5										25										
	26					46.7 37		37.2 38		E .5										26										
	27					48.5 36.5		37.2 38		NE .5										27										
	28					52.5 36.		37.2 38		NE 1										28										
	29					44.5 37.		37.2 38		E .5										29										
	30					40.5 36.5		37. 37.75	39 39.5	N.E.	E.									30										
	31					54.5 38		46 43.75	40.75 41.45	S.E.	E.									31										
Sums.																														
Means.																														
† Total Corrections for Instrumental Errors.																														
‡ Corrections for Diurnal Range.																														
“Corrected Means.”																														
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† for Temp. (Col. 2), =
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), =
Mean at Station, corrected, and at 32°,
Correction for height, feet above Mean Sea-level,
Mean, reduced to 32°, and Sea-level,
Highest Reading, corrected for Index error, on the th,
Lowest Do. Do., on the th,
Difference, or **Monthly Range**,
† Each instrument tested at the Office in Edinburgh, bears the stamp “S.M.S.” and a number to be entered in the Readings; or the Number and Initials of the Maker may be given.
†† Enlarging 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 Arithmetic Mean of Cols. 8 and 11 will be entered as the “Calculated Mean Temperature.”
‡‡‡‡ Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month**, (corrected for Index Errors), on the th,
Lowest in Month, corrected for Index errors, on the th,
Difference, or **Monthly Range**,
“Corrected Mean” of all the **Highest**, (Col. 5),
“Corrected Mean” of all the **Lowest**, (Col. 6),
Difference, or **Mean Daily Range**,
** Calculated **Mean Temperature** of Month,
S.-R. THERMOMETER, **Black Bulb** in Sun, **Highest**, (corrected for Index Errors), on the th,
“Corrected Mean”, (Col. 7), of **Black Bulb**, **Max. in Sun**,
Lowest at Night, **Black Bulb**, (corrected for Index errors), on the th,
“Corrected Mean”, (Col. 8), of **Black Bulb**, **Min. on grass**,
Difference of above Means or Range (“exposed”),
† Each instrument tested at the Office in Edinburgh, bears the stamp “S.M.S.” and a number to be entered in the Readings; or the Number and Initials of the Maker may be given.
†† Enlarging 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 Arithmetic Mean of Cols. 8 and 11 will be entered as the “Calculated Mean Temperature.”
‡‡‡‡ Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

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 Days; Amount in Inches,
WIND. SUMMARY.
Direction. N. N.E. E. S.E. S. S.W. W. N.W. Calm or Variable. Mean Force. Mean Velocity in miles per day.
A.M.
P.M.
Mean.

N.B.—The Sums to be correctly added and the Means deduced. Returns from the “Principal Towns” should be in Edinburgh not later than the 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 { The boys of Fetter College }

(Signed) James Martin

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

One of the objects of immediate importance that the Scottish Meteorological Society has proposed to itself, is to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparably, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire 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 precisely every reading at what time it was taken, if not at 9 o'clock.

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

Two moderate-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 scale is graduated. In taking an observation, this preliminary setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the vernier.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern upmost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a sharp 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 right 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.

Provision 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, 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 reunited by striking the instrument repeatedly against the palm of the hand; when near the top of the tube, and by high temperature, it will be found by heating that part over a lamp; the alcohol will evaporate and again condense, in contact with the body of the liquid. These instruments should be hung horizontally.

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

from radiation during night. Their bulbs have a black coating which may easily be made, or mounted, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the 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, underco 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 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, 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 frame-attached requirements shall be complied with, as far as possible. Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the top of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—89.3, 40.0, or 40.1; or again, 40.4, 40.2, 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 schedules, the indications registered on the 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

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

Careful observations ought to be made on the changes in the direction of the wind; and during storms, it is 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 noted 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 in account in the cloud column, though their appearances and changes may be noted among the "Remarks." The amount of cloud is generally from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the observation, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example,) will indicate that the upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of 2, ²/_{cr-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 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 put 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 Schönbem's or Moffitt'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 3⁵⁰, 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 3/4"; 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 observatory is necessary to every complete meteorological observatory.

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

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

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

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

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

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

BOOK-POST.

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

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 Rained.
Alder,					Barley,				
Ash,					Bere or Bigg,				
Beech,					Oats,				
Birch,					Wheat,				
Elm,					Beans,				
Larch,					Pease,				
Lime,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plane,					Rye Grass,				

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple,			Cuckoo,		
Bourtree or Elder,		Black Currant,			Curlew,		
Broom,		Cherry,			House-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Plover,		
Holly,		Peach,			Sand-Martin,		
Laburnum,		Pear,			Starling,		
Lilac,		Plum,			Swan,		
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., 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 Fettes College, County of _____in Lat. $55^{\circ}57'45''$, Long. $3^{\circ}13'20''$, Distance from Sea $1\frac{1}{4}$ miles.

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

During the MONTH of April 187 3.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS.		HYGROMETER.		WIND.		RAIN.	CLOUDS.		SUNSHINE.	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.		Direction.	Force.		9 h. A.M.	P.M.	No. 8 inches.					No. 12 inches.	No. 22 inches.								
																							Barometer.	Attached Thermometer.	Max. in Shade.	Min. in Shade.	Max. in Sun.	Min. on Grass.	Dry bulb.	Wet bulb.
	1																													
	2																													
	3																													
	4																													
	5																													
	6																													
	7																													
	8																													
	9	30.300	56°																											
	10	30.328	54°																											
	11	30.046	53°																											
	12	29.934	50.5																											
	13	29.260	50.																											
	14	29.784	49.5																											
	15	29.700	50.																											
	16	29.600	48.																											
	17	29.600	46.																											
	18	29.800	47.																											
	19	30.000	46.5																											
	20	30.200	49.																											
	21	30.150	49.																											
	22	30.956	47.8																											
	23	29.900	45.5																											
	24	29.800	46.																											
	25	30.100	46.8																											
	26	30.050	46.																											
	27	30.000	46.																											
	28	29.350	47.8																											
	29	29.984	51.																											
	30	29.850	51.5																											
	31																													
Suns.				1616.3	1264.3			1283	1233																					
Means.				53.9	42.1			42.9	41.1																					
Total Corrections for Instrumental Errors.																														
Corrections for Diurnal Range.																														
Corrected Means.																														
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

NOTATION USED IN GENERAL REMARKS.

a.	aurora.	m.	meteor.
ci.	cirrus.	ms.	meteors.
ci-cu.	cirro-cumulus.	n.	nimbus.
ci-s.	cirro-stratus.	r.	rain.
cu.	cumulus.	h. r.	heavy rain.
cu-s.	cumulo-stratus.	c. h. r.	continued heavy rain.
d.	dew.	s.	stratus.
f.	fog.	sc.	scud.
fr.	frost.	sl.	sleet.
h-fr.	hoar-frost.	sn.	snow.
h.	haze.	so. ha.	solar halo.
h. d.	heavy dew.	sq.	squall.
h. l.	hail.	sq.	squalls.
l.	lightning.	t.	thunder.
l. cl.	light clouds.	t. s.	thunder storm.
l. sh.	light showers.	w.	wind.
lu. co.	lunar corona.	w.	wind.
lu. 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 \pm for Temp. (Col. 2), = _____

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

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

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

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

Highest Reading, corrected for Index error, on the _____ th, = _____

Lowest Do. Do. on the _____ th, = _____

Difference, or Monthly Range, = _____

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

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

Difference, or Monthly Range, = _____

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

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

Difference, or Mean Daily Range, = _____

** Calculated Mean Temperature of Month, = _____

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

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

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

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

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

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

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 _____ Days; Amount in Inches, = _____

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.											
P.M.											
Mean.											

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 3d; those from Other Places, not later if possible than the 5th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by The boys & Mr. Weir Head-gardener

(Signed) James Blairkie

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

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

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

The Barometer should be suspended in a good *level*, which may be 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 tipped 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 exactly adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, *Self-registering Thermometers*, Professor Phillips's and Negretti and Zamboni Patent "Maximum" Thermometers, and recommended: printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended when graduated on the glass, and affixed to a frame separate from the "Maximum." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be 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 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. On 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 bulbs;—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 protected 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 form 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 box-work out of the tin case, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.5, 40.0, or 40.1; or again, 40.3, 40.3, or 40.3, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40°, respectively. So also 40.1, and 40.1, more or less must be read 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 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 inclines incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

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

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

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

Snow-falls only 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 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," S. W. (for example), will indicate that the upper strata of clouds travel with *zephyrus* velocity from S. W., and those in the lower regions from W., with one-third the (zephyrus) 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 proper column. **Underground Thermometers.**—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

Temperatures of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well ought to be registered. **Temperatures of Wells.**—Mention whether Schœnbein's or McFild's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—Thus 5-7, 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 1/2, 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, 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, remarkably deep depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind affecting their magnitude, as well as such notes on storms as have been entered at other times. 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-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 *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.

Edinburgh, 10th November 1867.

(By Order) A. B.

BOOK-POST.

EDINBURGH.

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

MR ALEXANDER BUCHAN,

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For the College
April 1873

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.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Fettes College*County of *Edinburgh*in Lat. *55°57'45"*, Long. *3°13'20"*, Distance from Sea *1 1/2* miles.

Height of Cistern of the Barometer above Mean Sea-level _____ feet, above Ground _____ 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. _____				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.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.							Temperature of Wet test. No.	Temperature at surface and Density.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
		Barometer. No. _____	Attach- ed Ther- mometer	Barometer. No. _____	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force.	Direc- tion.	Force.			Direc- tion.	Amount (0-10), and Species.	Velocity (0-10), and Direc- tion.	Amount (0-10), and Species.	Velocity (0-10), and Direc- tion.	Amount (0-10), and Species.	No. _____ 3 inches.								No. _____ 12 inches.	No. _____ 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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NOTATION USED IN GENERAL REMARKS.

h. a.	denotes aurora.	m. m.	denotes meteor.
ci. c.	cirrus.	ns. n.	nocturnal.
ci. cu.	cirro-cumulus.	an. a.	anterior.
ci. s.	cirro-stratus.	v. v.	vertical.
cu. c.	cumulus.	h. r.	heavy rain.
cu. s.	cumulo-stratus.	c. h. r.	continued heavy rain.
d. d.	dew.	s. s.	stratus.
f. f.	fog.	sc. s.	scud.
fr. fr.	frost.	sl. sl.	sleet.
h. h.	hoar-frost.	sn. sn.	snow.
h. d.	haze.	so. h.	solar halo.
h. d.	heavy dew.	sq. sq.	squall.
h. l.	halo.	sps. sps.	squalls.
l. l.	lightning.	t. s.	thunder storm.
li. cl.	light clouds.	w. w.	wind.
li. sh.	light showers.	g. g.	gale of wind.
lu. co.	lunar corona.		
lu. h.	lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction †† = _____
for Temp. (Col. 2), = _____
“Corrected Mean” of Barometer at 9 P.M., minus the Correction †† = _____
for Temp. (Col. 4), = _____
Mean at Station, corrected, and at 32°, = _____
Correction for height, _____ feet above Mean Sea-level, = _____
Mean, reduced to 32°, and Sea-level, = _____
Highest Reading, corrected for Index error, on the _____ th, = _____
Lowest Do. Do. on the _____ th, = _____
Difference, or Monthly Range, = _____

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the _____ th, = _____
Lowest in Month, corrected for Index errors, on the _____ th, = _____
Difference, or Monthly Range, = _____
“Corrected Mean” of all the Highest, (Col. 5), = _____
“Corrected Mean” of all the Lowest, (Col. 6), = _____
Difference, or Mean Daily Range, = _____
** Calculated Mean Temperature of Month, = _____

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = _____
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 _____ Days; Amount in Inches, = _____

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.											
P.M.											
Mean.											

* 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.
† Embending corrections for both capillarity and Index Errors.
‡ The diurnal range for Scotland is as yet unknown.
†† Practically, though not absolutely a minus correction.
‡‡ These “Hygrometric Deductions” are calculated from Gladstone’s Hygrometric Tables, Second Edition only.
While the diurnal range is unknown, the Arithmetic 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 err.

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

Observations made and
Return verified by

(Signed)

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

One of the objects of immediate importance, that the Scottish Meteorological Society has proposed to itself, is to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society 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. 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-sized Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its scale-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 flat-iron, 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, which stean passes freely through the lid and case of the cistern. When the index-line on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the scale is graduated. In taking an observation, this preliminary setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the vernier.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern upmost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a sharp tap is produced. If this is prevented by air, it may be removed to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by lighting the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired 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 Thermometer 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 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 the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made open to the south. These Boxes may be had from the opticians, 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 Rubicord is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two drawbacks, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found 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 blacked boxes, whose sides protect the bulbs from the sun and wind. The "Maximum" should rest on wooden supports a few inches from the surface of the glass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

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

The Hygrometer consists of two Thermometers usually, but not necessarily mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must hang down by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs—the mesh must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the mesh is always clean and moist, and the writer 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 the Thermometer is enclosed in a tin case, which 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 wooden frame out of the tin case, and hanging them side by side, so that the frame mentioned 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—59.3, 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 Rubicord'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. 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 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 unavoidable 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 storm occurs it must be noted in the "Remarks." 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 Laire 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 condensation 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 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, notwithstanding the temperature of the air, and depth of observation; and continuing to observe for particular depths.

Temperature of Water.—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 well noted.

Ozone.—Mention whether Schönbach's or Meißner's papers are used. The paper is affixed by a pin to a board in the user-monometer box, and the 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 $\frac{3}{4}$, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4," i.e., that it is blowing gently.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A paper 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 at Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attending them, maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side-marginal. Additional remarks may be made on the side-marginal. It is desired that observations by the side-marginal possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of the 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, 20th November 1852.

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,		Gooseberry,			Plover,		
Holly,		Peach,			Sand-Martin,		
Laburnum,		Pear,			Starling,		
Lilac,		Plum,			Swan,		
Mezerion,		Strawberry,			Rail or Corn Crake,		
Mountain Ash or Rowan,							
Red Flowering Currant,							
Rhododendron Ponticum,							
Whin,							

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

Edinburgh
May 1853.
MR ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland,
General Post Office Buildings,
EDINBURGH.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Fettes College, Edinburgh, County of Edinburgh, in Lat. 55° 57' 45", Long. 3° 13' 26", Distance from Sea 1 1/4 miles.
Height of Cistern of the Barometer above Mean Sea-level 150 feet, above Ground feet.
During the MONTH of June 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. ———				WIND.				RAIN.	CLOUDS.				SUNSHINE. Hours.	THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.	
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. P.M.		9 h. A.M.			9 A.M.		P.M.			9 h. A.M.							
		Barometer, No.	Attached Ther- mometer	Barometer, No.	Attached Ther- mometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches. No.	Velocity (0—6), and Direction.	Amount (0—10), and Species.	Velocity (0—6), and Direction.	Amount (0—10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of Water at depth of feet. No.	Temperature at 1 fathom and Density.	0—10. 9 A.M., 9 P.M.		
		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
	1	30.056	55.5	30.140	58	59.5	37.25			57	50	49	49	E	1.5	NE	2													1	
	2	30.168	56	30.094	59	64.5	47.5			54	53	50	49.5	E	1	E	1.5													2	
+	3	30.075	59	29.898	60	62	49.5			52.5	51	51	50.5	E	1	E	1.5													3	
	4	29.816	58	29.756	57	60.5	50			50.75	50.75	52.5	53	E	1.5	E	1													4	
	5	29.798	60	29.932	58	68	45.75			62.75	59.5	53.5	52	E	2	WNW	1.5													5	
	6	30.036	55	30.052	57	65	49			50.5	47.75	49.5	48	E	.5	SE	1													6	
	7	30.138	60	30.064	55	65	48.5			51.75	52	50	48.5	SE	1.5	E	2													7	
7	8	29.955	60.75	29.932	59	72	44.75			65.5	59.5	51.5	49.5	SW	1	W	.5													8	
29.759	9	29.450	60.5	29.542	60	60.5	47	50.37		58.5	57	50	48	W	1.5	NW	1													9	
	10	29.294	60	29.326	60	65.5	45.5			54	51	52	51	NE	1.5	E	1													10	
	11	29.382	62	29.420	60	60	42.8			52	48	51.5	50.2	NW	.5	W	1													11	
	12	29.454	57	29.478	55	59	42			51.3	52	53	52.5	W	1	SW	.7													12	
	13	29.456	57.5	29.492	57	58	45			59	58.6	49.5	48	NW	1	W	1.5													13	
	14	29.660	61.5	29.640	59	67	40			51.5	50	51.5	50	WNW	1	W	1.5													14	
	15	29.661	61	29.660	60	61	47.5			54.2	50	51	49.5	SW	1.5	W	1													15	
	16	29.772	62.5	29.826	58	63	48			53	51.5	52.5	51	E	1	E	.5													16	
	17	29.896	60	29.860	60	61.5	49			57.5	56	50	49	E	1.5	SE	1.5													17	
	18	29.852	59.5	29.850	61	69.5	48			61	59.5	49.5	47.5	SE	1.5	NE	1.5													18	
	19	29.786	60.5	29.780	62	63	46.5			62.5	58.5	50	48.5	SW	2	W	1.5													19	
	20	29.893	64.5	29.830	59.5	59	49.5	SAB		59.5	59	50.5	49.5	NW	1.5	W	1													20	
9.720	21	29.930	62.5	29.963	66	67	50	SAB		57	57	50	50	W	2.5	SW	2													21	
SAB	22	29.729	65	29.722	60	67.5	50	SAB		59.5	60	54	51	W	3	SW	2.5													22	
	23	29.790	62	29.756	63	64.5	51	SAB		59.5	60	53.5	51	W	1	W	1.5													23	
	24	29.581	67	29.422	63	68	50	SAB		60.5	60	54.5	54	SW	2.5	W	2													24	
	25	29.561	68.5	29.910	59	61	49	SAB		59.5	55.5	52	50	W	2	NW	2													25	
	26	29.897	60	29.714	60	61	48.5	SAB		56	58	56	55	NW	3	W	2.5													26	
	27	29.734	61	29.613	62	60	49.5			58	58	59	58	W	3	NW	2													27	
	28	29.690	59	29.853	56	61	48	SAB		56	51	52.5	53	E	1	ESE	1.5													28	
	29	29.760	56	29.736	58	59	50	SAB		56	59	53	53	SE	1	SE	X													29	
X	30	29.750	60	29.755	56	69	49			62	58	56.5	55	W	1	X														30	
	31																														31
Sums.		891.720	1167	2231.027	773	10152	180			177.511	86.5	832	52	455	407			0.84													
Means.		29.744	59.7	29.744	59.7	62.8	47.6			56.8	54.6	52.0	50.9	1.52	1.36																
+ Total Corrections for Instrumental Errors.		x.060		x.060		-6	+3			-6		-6		06	06																
+ Corrections for Diurnal Range.																															
"Corrected Means."		29.834		29.829		62.847	6			54.0		50.3																			
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

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

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\frac{1}{10}$ for Temp. (Col. 2), = 29.749
"Corrected Mean" of Barometer at 9 P.M., minus the Correction $\frac{1}{10}$ for Temp. (Col. 4), = 29.748
Mean at Station, corrected, and at 32°, = 29.748
Correction for height, feet above Mean Sea-level, = 1.65
Mean, reduced to 32°, and Sea-level, = 29.913
Highest Reading, corrected for Index error, on the 2nd th, = 30.168
Lowest Do. Do., on the 10th, = 29.294
Difference, or Monthly Range, = 0.874

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 8th, = 71.4
Lowest in Month, corrected for Index errors, on the 1st th, = 37.5
Difference, or Monthly Range, = 33.9
"Corrected Mean" of all the Highest, (Col. 5), = 62.8
"Corrected Mean" of all the Lowest, (Col. 6), = 47.6
Difference, or Mean Daily Range, = 15.2
** Calculated Mean Temperature of Month, = 55.2

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 54.4
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 52.2
Computed Temperature of Dew-Point, = 50.0
Do. Elastic Force of Vapour, = 361
Do. Weight of Vapour in a Cubic Foot of Air, =
Relative Humidity, (Saturation = 100), = 85
RAIN fell on 8 Days; Amount in Inches, = 0.84

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		0	1	9	3	0	4	9	4	0	1.52
P.M.		0	2	7	2	0	3	11	3	0	1.36
Mean.		0	2	8	2	0	4	10	3	1	1.44
		0	2	8	2	0	4	10	3	1	

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

Observations made and
Return verified by

Prof. of Fettes College

(Signed)

James Blair

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

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

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (nominally or 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 recommended by Mr. Aikin of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *read-inkles* 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 hook, 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 *seize up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails the instrument must be repaired.

The Barometer should be suspended in a *good light*, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire. In taking an *Observation*, the attached Thermometer is first noted: the tube must then be gently tapped and the cistern adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index;—usually the lower edge of the *vernier*, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and 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 "Marinium" Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "Marinium" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Marinium." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *columns* of spirit break, it may be re-united by 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 thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 "Marinium" Thermometers ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometric Deductions" Observers are specially requested to attend to the following conditions:—The bulbs must *not* 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 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 fast as the air is drier than 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 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 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 40.4°, respectively. So also 40.2, and 40.3, 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 note their occurrence to their proper meteorological day. In the Society's schedule, the indications registered on the 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d. *Wind.*—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, &c. Careful observations ought to be made on the changes in the direction of the wind; and during storms, it is earnestly recommended that extra observations be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

The Council recommend that every 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.

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

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

and Direction, $\frac{2}{W}$, (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 $\frac{2}{cr-st}$, (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 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 climate, 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 20th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, nothing alters 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 Scheibner's or Moffit's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3^{xx}, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, 0—6 is "4"; i.e., that it is *blewing fresh*.

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

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

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

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 *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 publishers.

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.

BOOK-POST.

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 Rained.
Alder,					Barley,				
Ash,					Bere or Bigg,				
Beech,					Oats,				
Birch,					Wheat,				
Elm,					Beans,				
Larch,					Pease,				
Lime,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plane,					Rye Grass,				

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple,			Cuckoo,		
Bourtree or Elder,		Black Currant,			Curlew,		
Broom,		Cherry,			House-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Plover,		
Holly,		Peach,			Sand-Martin,		
Laburnum,		Pear,			Starling,		
Lilac,		Plum,			Swan,		
Mezerion,		Strawberry,			Rail or Corn 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; or 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 Fettes College, County of _____, in Lat. _____, Long. _____, Distance from Sea _____ miles.
Height of Cistern of the Barometer above Mean Sea-level 150 feet, above Ground _____ feet. During the MONTH of July 1873.
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, at 9 h. A.M.	Exposed Black Bulb.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.		Direction.	Force.	9 h. A.M.	P.M.	No. 8.					No. 12.	No. 22.										
																						No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
	1	29.857 64	29.870 66	63								1	10						1												
	2	804 64	700 66	70								10	6						2												
	3	608 66	500 65	61								9	8						3												
	4	382 65	557 65	62.5								4	0						4												
	5	603 63	465 65	71								0	9						5												
	6	29.524 63	29.802 68	64 53.5								7	3						6												
	7	816 63	813 67	71 53.5								3	6						7												
	8	811 65	816 66	69 59.5								10	10						8												
	9	836 67	760 68	62 53								0	10						9												
	10	499 63	598 63	62.5 56								4	1						10												
	11	594 63	524 62	66 57.5								4	10						11												
	12	466 61	420 61	63.5 57								10	10						12												
	13	392 59.5	428 61	67 49								3	0						13												
	14	362 63	400 61	68 48								0	0						14												
	15	468 68.5	660 60	61.5 45								2	6						15												
	16	806 60	894 61	63 47								2	5						16												
	17	734 60	496 67	71 49.5								10	10						17												
	18	518 62	738 63	62 54								8	10						18												
	19	814 59	766 62	62 50								10	1						19												
	20	780 64	920 68	60.3								10	0						20												
	21	970 71	949 71	63 55								0	0						21												
	22	860 71	784 71	83.5 59.5								0	10						22												
	23	800 70.5	860 70	77 49.5								10	10						23												
	24	813 65	760 67	74 60								2	3						24												
	25	770 65	675 67	69 54.8								10	10						25												
	26	732 65	748 65	72 49								1	0						26												
	27	719 64.5	712 63	65.5 55								2	9						27												
	28	736 63	798 61	69.5 47								7	0						28												
	29	814 66.0	763 65	63.5 50								10	10						29												
	30	702 63	652 67									10	10						30												
	31	562 66	670 65									10	0						31												
Sums.		21.153 133.021	4.98 157.5	727.4								159	177																		
Means.		29.682	64.32	69.4	65.1	67.8	53.4					5.1	5.7																		
† Total Corrections for Instrumental Errors.		+060	+060	-6+3																											
† Corrections for Diurnal Range.																															
"Corrected Means."		29.742	29.752	67.2	65.3	67.4																									
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteor.
ci-cu.	" cirro-cumulus.	u.	" nimbus.
cu.	" cumulus.	r.	" rain.
cu-s.	" cumulo-stratus.	h.r.	" heavy rain.
d.	" dew.	c.h.r.	" continued heavy rain.
f.	" fog.	s.	" stratus.
fr.	" frost.	sc.	" scud.
h-fr.	" hoar-frost.	sl.	" sleet.
h.	" haze.	sn.	" snow.
h.d.	" heavy dew.	so. lu.	" solar halo.
hl.	" hail.	sq.	" squall.
l.	" lightning.	sqs.	" squalls.
li. cl.	" light clouds.	t.	" thunder.
li. sh.	" light showers.	t.s.	" thunder storm.
lu. co.	" lunar corona.	w.	" wind.
lu. 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†† for Temp. (Col. 2), = 29.742 - 0.95 = 29.647
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 29.752 - 0.97 = 29.657
Mean at Station, corrected, and at 32°, = 29.652
Correction for height, feet above Mean Sea-level, = 165
Mean, reduced to 32°, and Sea-level, = 29.817
Highest Reading, corrected for Index error, on the 21st, = 29.970
Lowest Do. Do. on the 14th, = 29.362
Difference, or Monthly Range, = 0.608

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 22nd, = 82.9
Lowest in Month, corrected for Index errors, on the 15th, = 45.3
Difference, or Monthly Range, = 37.6
"Corrected Mean" of all the Highest, (Col. 5), = 67.2
"Corrected Mean" of all the Lowest, (Col. 6), = 53.4
Difference, or Mean Daily Range, = 13.8
** Calculated Mean Temperature of Month, = 60.3
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the _____, = _____
"Corrected Mean" (Col. 7), of Black Bulb, Max. in Sun, = _____
Lowest at Night, Black Bulb, (corrected for Index errors), on the _____, = _____
"Corrected Mean" (Col. 8), of Black Bulb, Min. on grass, = _____
Difference of above Means or Range ("exposed"), = _____

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 59.8
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 56.4
†† Computed Temperature of Dew-Point, = 53.4
†† Do. Elastic Force of Vapour, = 4.09
†† Do. Weight of Vapour in a Cubic Foot of Air, = _____
†† Relative Humidity, (Saturation = 100), = 80
RAIN fell on Days; Amount in Inches, = _____

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	2	4	0	2	6	13	2	1		1.50	
P.M.	0	0	0	1	1	10	12	3	4		0.97	
Mean.	1	1	2	0	2	8	12	3	2		1.24	1.54

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

Observations made and
Returns verified by James Blair, Esq.

(Signed)

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Fettes College, County of Edinburgh, in Lat. 55° 57' 45", Long. 3° 13' 20", Distance from Sea 1 1/4 miles.
Height of Cistern of the Barometer above Mean Sea-level 123 feet, above Ground feet. During the MONTH of August 1873.

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.		Readings of the H. Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.									
		No.	°	No.	°	No.	°	No.	°	No.	°	No.	°	No.	°	No.	°	No.	°			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.
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max.	Min.	Max. in Sun any day.	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	9 h. A.M.	No.			Amount in inches.	No.	Amount (0-10), and Direction.	Velocity (0-10), and Direction.	Amount (0-10), and Species.					Hours.	No.	3 inches.	No.	12 inches.
		inches.	°	inches.	°	°	°	°	°	°	°	°																							
	1	29.750	62			61.5	52			61	58																					The Barometer stands 123 ft.	1		
	2	29.440	64			65.2	57.3			60.5	56.5																					2			
	3																																3		
	4	29.722	60			68	57.8			59.5	57																						4		
	5	29.700	60			61	52			58	56																						5		
	6	29.600	62			64.5	56			62	59																						6		
	7																																7		
	8	29.920	63			62	54			59	59																						8		
	9	29.850	60			65	48			59	57																						9		
	10																																10		
	11	30.	59			60	55			56	55																						11		
	12	29.950	60			62	54			59	52																						12		
	13	29.626	61			65.5	56.3			62	61																						13		
	14	29.838	60.5			66.8	52			62	60																						14		
	15	29.948	61.5			67.5	51			64.5	61.8																						15		
	16	29.706	62			70	59.3			62	61.3																						16		
	17	29.948	59			69.5	49.5			59	57.8																						17		
	18	29.650	63.5			62	52			56.5	56																						18		
	19	29.524	64			62	53.5			56	53.5																						19		
	20	29.550	59			62	43.5			56	53.5																						20		
	21	29.538	61			64	50			54	53.5																						21		
	22	29.634	59			64.5	50			58.8	57																						22		
	23	29.740	59			64.5	45.5			62	60																						23		
	24	29.901	60			63.5	48.8			55.8	55																						24		
	25	29.950	61.5			64	52			55	53.5																						25		
	26	29.716	60			61	52.5			60.5	60																						26		
	27	29.504	60			72	52.5			60	59																						27		
	28	29.242	60.5			65.5	53.5			64	61																						28		
	29	29.300	58			68.3	49			56.5	55																						29		
	30	29.516	60			65.8	51.5			61.5	59																						30		
	31																																	31	
27	Sums.	1877.972				496.63	116			593.5	57.3																								
		19.263	195			1276	52.5			1501	196.9																								
Means.		29.7	136.7			64.7	52.0			59.3	57.3																								
† Total Corrections for Instrumental Errors.		+ .060				- 6	+ 3			- 6																									
‡ Corrections for Diurnal Range.																																			
“Corrected Means.”		29.773				64.1	52.3			56.7																									
No. of Columns.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

BAROMETER, "corrected Mean" (at 9 A.M., minus the Correction†) = 29.687
for Temp. (Col. 2), = 29.773 - 0.086
"Corrected Mean" of Barometer at 9 P.M., minus the Correction† =
for Temp. (Col. 4), =
Mean at Station, corrected, and at 32°, = 29.687
Correction for height, feet above Mean Sea-level, = 138
Mean, reduced to 32°, and Sea-level, = 29.825
Highest Reading, corrected for Index error, on the 11th, = 30.000
Lowest Do. Do. on the 28th, = 29.242
Difference, or Monthly Range, = 0.758

Each instrument used 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.
† Estimating corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
‡ These "Hygrometrical Corrections" are calculated from Glaisher's Hygrometrical Tables, Second Edition only.
While the Diurnal Range is unknown, the Arithmetic Mean of Cols. 9 and 11 will be entered as the "Calculated Mean Temperature."
Any Observations not made under the conditions specified in the Directions on the other side, or not in the Top of each column, must be marked as such by the observer in each Schedule. See page.

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

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 27th, = 71.4
Lowest in Month, corrected for Index errors, on the 20th, = 43.8
Difference, or Monthly Range, = 27.6
"Corrected Mean" of all the Highest, (Col. 5), = 64.7
"Corrected Mean" of all the Lowest, (Col. 6), = 52.3
Difference, or Mean Daily Range, = 11.8
** Calculated Mean Temperature of Month, = 58.2

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 59.3
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 56.7
† Computed Temperature of Dew-Point, = 54.4
† Do. Elastic Force of Vapour, = 47.4
† Do. Weight of Vapour in a Cubic Foot of Air, = 4.75
† Relative Humidity, (Saturation = 100), = 85

WIND.												SUMMARY.			
Direction.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.	Estimated Force 0-6.	Common Designation.	Estimated Force 0-6.	Common Designation.
A.M.															
P.M.															
Mean.															

Greatest daily range 20.0 on the 17th
(Signed) M. J. J. J.

Greatest daily range = 20.0 on the 17th

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be 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 *slangy tap* is produced. If this is prevented by air, it may be removed to the cistern and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good *level*, which may be 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 Zamboni's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rüchters is recommended when graduated on the glass from 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-joined by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be 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 formed, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "*Maximum*" should be freely exposed to the sun, and the "*Minimum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

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

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

One form of "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 hygrometrical requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.9, 40.0, or 40.1; or again, 40.4, 40.5, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40½°, and 40¾°, more or less must be registered 40.2, 40.3, and 40.7, or 40.8 respectively. In reading Rüchters'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 *sd* are those of a series of phenomena commencing at 9 p.m. on the *sd*, and extending till 9 p.m. on the *3d*.

Wind.—A wind-gauge 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 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 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-gauges. For wind, rain, and snow, as indicated in every column, the observer cannot, too carefully 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 30° 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 from 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 $\frac{2}{2}$, cu-st., (*eq*) 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 apparatus, from the ends of posts and rocks round the coast, when 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 35 feet (one fathom), and after ten minutes elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. *Ozone.*—Mention whether Schönbach's or Moffat's papers are used. 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 9.4, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0-6 is "4" i.e., that it is *blowing fresh*.

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

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

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

Edinburgh, 14th November 1892. (By Order) A. B.

BOOK-POST.

EDINBURGH.

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



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OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

Have the 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 Fettes College, County of Edinburgh, in Lat. 55° 37' 45", Long. 3° 13' 20", Distance from Sea 1/4 miles.Height of Cistern of the Barometer above Mean Sea-level 123 feet, above Ground feet.During the MONTH of September 1873.

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, No.	Attached Thermometer, No.	Barometer, No.	Attached Thermometer, No.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H. Cup Anemometer, No.	No. of hours in which it fell.	Amount in inches.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.					SUNSHINE.	No. 1.	No. 12.	No. 22.	Temperature of WET Bulb at height of feet, No.	Temperature at 1 fathom, and Density.	9 A.M.
		inches.		inches.		°.	°.	°.	°.	°.	°.	°.					9 h. A.M.								Hours.	No. 1.	No. 12.	No. 22.							
	1	29.436	59			64.	43.8			58.5	57.2									350													1		
	2	29.644	60			66.8	50.5			56	52.8									350													2		
	3	29.844	58			63.5	48.5			53.1	52.8									.050													3		
	4	Barometer being repaired				59	47.8			56.3	55									.500													4		
	5					61.8	48			52	51									.0													5		
	6					58	45			52.2	51									.0													6		
	7																			.0														7	
	8	29.708	58			59	36.5			55.5	53									.0														8	
	9	29.522	55			63	39.3			54	52.5																							9	
	10	29.342	57			61	57			57.5	56									.300														10	
	11	29.601	52			62	48.5			57.5	55.5									.0														11	
	12	29.550	52.5			62	49.5			59	57									.130														12	
	13	29.804	56			62	45.8			56	55									.0														13	
	14																			.0															14
	15	29.326	54			60.8	42			51.5	51									.550														15	
	16	29.442	55			59	45			55	52									.0														16	
	17	29.260	53			60	42			52	52									.450														17	
	18	29.448	53			62.2	45			55	52.9									.400														18	
	19	29.422	57.5			57.5	46			55	54									.250														19	
	20	29.648	60.5			65.5	48.8			64.2	62									.400														20	
	21																																		21
	22	30.420	55			69.5	39.5			59.3	52									.0														22	
	23	30.336	57			61.3	49			59.5	53.3									.0														23	
	24	30.644	56			66	41			58	52.8									.0														24	
	25	30.620	58			67.5	44.5			58.8	58.8									.0														25	
	26	30.644	58			65.5	51.5			58	58.5									.0														26	
	27	29.736	62.5			77	50			75	69									.0														27	
	28																																		28
	29	30.142	52			77	40			52	50									.0														29	
	30	30.032	54.5				41.5			46	45																							30	
	31																																		31
Sums.		18.283	3154.5			889	400			1609	119.5									3730															
Means.		29.798	56.7			63.6	45.4			56.2	54.6																								
+ Total Corrections for Instrumental Errors.		+0.60				-6	+3			-6																									
+ Corrections for Diurnal Range.																																			
"Corrected Means."		29.855				63.0	45.7																												
No. of	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					

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.	

NOTATION USED IN GENERAL REMARKS.					
a.	denotes aurora.	m.	denotes meteor.		
ci.	" cirrus.	ms.	" micrometeor.		
ci-cu.	" cirro-cumulus.	b.	" nimbus.		
ci-s.	" cirro-stratus.	r.	" rain.		
cu.	" cumulus.	h.r.	" heavy rain.		
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.		
d.	" dew.	s.	" stratus.		
f.	" fog.	sc.	" sand.		
fr.	" frost.	sl.	" sleet.		
h-fr.	" hoar-frost.	sn.	" snow.		
h.	" haze.	so. ha.	" solar halo.		
h-d.	" heavy dew.	sq.	" squall.		
hl.	" hail.	sqs.	" squalls.		
l.	" lightning.	t.	" thunder.		
li. cl.	" light clouds.	t. s.	" thunder storm.		
li. sh.	" light showers.	w.	" wind.		
lu. co.	" lunar coronae.	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 for Temp. (Col. 2), = 29.780
"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), =
Mean at Station, corrected, and at 32°, =
Correction for height, 1.135 feet above Mean Sea-level, =
Mean, reduced to 32°, and Sea-level, = 29.915
Highest Reading, corrected for Index error, on the th, =
Lowest Do. Do. on the th, =
Difference, or Monthly Range, =

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 29 th, = 77.0
Lowest in Month, corrected for Index errors, on the 8 th, = 36.5
Difference, or Monthly Range, = 40.5
"Corrected Mean" of all the Highest, (Col. 5), = 63.0
"Corrected Mean" of all the Lowest, (Col. 6), = 45.7
Difference, or Mean Daily Range, = 17.3
** Calculated Mean Temperature of Month, = 54.4
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the th, =
"Corrected Mean," (Col. 7), of Black Bulb Max. in Sun, =
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =
Difference of above Means or Range, ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 56.2
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 54.0
Computed Temperature of Dew-Point, = 54.9
Do. Elastic Force of Vapour, = 3.88
Do. Weight of Vapour in a Cubic Foot of Air, =
Relative Humidity, (Saturation = 100), = 86
RAIN fell on 11 Days; Amount in Inches, = 3.73

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.											
P.M.											
Mean.											

N.B.—The Sums to be correctly added and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 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
Returned verified by Miss Wey Garden

(Signed) James Blair

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

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

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

Barometer.—*Weather glasses* and *aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Not 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-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 and 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 *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 upwards. 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 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 "Marine" 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 from and affixed to a frame separate from the "Maximum." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand, when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be 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 mounted, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 for each 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 mesh must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the mesh is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—38°·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°·1, respectively. So also 40°·2, and 40°·3, 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 extreme may occur at any hour; and it is necessary to read their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 8th 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, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, &c.

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity 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 $\frac{2}{2}$ (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 fixed with sloping tin coils, or wooden frames, water being conveyed to the bulbs by the stems; or wooden frames, 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.

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BOOK-POST.

EDINBURGH.

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

MR ALEXANDER BUCHAN,

76

Edinburgh
Sept. 1873

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

Have the 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 Fettes College, County of Edinburgh, in Lat. _____, Long. _____, Distance from Sea _____ miles.
Height of Cistern of the Barometer above Mean Sea-level 123 feet, above Ground _____ feet.
During the MONTH of October 1873.
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 h. A.M.		9 h. P.M.		9 h. A.M.														
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H.C. Anemometer.	No. of hours in which it fell.	Amount in inches.	Velocity (0-5), and Direction.	Amount (0-10), and Species.						Velocity (0-5), and Direction.	Amount (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of Well, at depth of feet. No.	Temperature at 1 fathom, and fathoms.	0-10.	9 A.M. 9 P.M.
		No.	inches.	No.	inches.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.						No.	No.	No.	No.	No.	No.	No.	No.	No.
	1	29.725	53.5	30.090	54.5	53	49			50	49	51	50.5																				1			
	2	29.884	56.5	29.862	57	53	50			52	51.5	51	50																				2			
	3	29.786	56	29.824	59	53	49			57	50	51	51																				3			
	4	30.348	58	29.650	59.5	52	46.5			49.5	47	51	50																				4			
	5	30.536	55	30.386	57	59	38			49	49	53	53																				5			
	6	30.448	52.5	29.620	62	54	42			47	46	54	53																				6			
	7	29.836	54	29.636	53.5	55.5	42.5			47	46	42	42																				7			
	8	29.576	53	29.734	53	53	35			43	42.5	38	38																				8			
	9	29.628	50	29.572	58	58	30.6			41.5	41.5	35.5	35.5																				9			
	10	29.438	52	29.460	60.5	54	51			38.5	51.5	51.5	51																				10			
	11	29.382	55.5	29.438	58	64.5	48			51	50.5	47	46.5																				11			
	12	29.628	53.5	29.610	58	50	41			47	47	46	45																				12			
	13	29.564	51	29.578	56	50	30			42.5	43	43	43																				13			
	14	29.650	51	29.730	53.5	52	32.5			43	43	41	40.5																				14			
	15	29.768	50	29.860	53	53	35			44	43	41	40																				15			
	16	29.880	50.5	29.848	56	58	32.5			41	41	52	51.5																				16			
	17	29.868	52	29.852	58	55	45			50.5	50.5	52	52																				17			
	18	29.766	54	30.036	51	58	42.5			53	52	46.5	46.5																				18			
	19	30.126	54	29.860	56	58	44.5			47	47	40	39.5																				19			
	20	29.564	50.5	29.736	55	58	34			37	37	37	37																				20			
	21	29.448	50	29.158	53	49	34			42	41	44	44																				21			
	22	28.812	58.5	28.730	57	49	44			44	43.5	38	36																				22			
	23	28.742	46.7	28.876	48.5	52	33			49	41	40	40																				23			
	24	29.158	46.5	29.157	49	50	31			42	41	39	38																				24			
	25	29.526	46	29.738	50	49	28			37	37	44	44																				25			
	26	29.932	49	30.164	47	48	38			45	45	39	39																				26			
	27	30.292	46	30.376	57	50	32			44	43	42	42																				27			
	28	30.350	48	30.188	53	53	34			46	45	48	47																				28			
	29	30.074	49	29.996	58	49	32			49	48	47	46																				29			
	30	29.860	50	29.634	51	49	38			47	46	42	42																				30			
	31	29.400	48	29.076	51.5	47	38			47	47	45	44																				31			
	Sums.	29.5543	22.513	29.6397	25.96					184.5	165.5	171.5	157.5																							
	Means.	29.741	52.1	29.786	54.7	53.1	38.2			45.9	45.9	45.5	45.1																							
	† Total Corrections for Instrumental Errors.	+0.60		+0.60		-6	+3			-6		-6																								
	† Corrections for Diurnal Range.																																			
	“Corrected Means.”	29.712	51.1	29.709	54.1	52.5	38.7			45.8	44.7	45.5	44.5																							
	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					

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction for Temp. (Col. 2), = 29.712
“Corrected Mean” of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = 29.709
Mean at Station, corrected, and at 32°, = 29.712
Correction for height, feet above Mean Sea-level, = 1.38
Mean, reduced to 32°, and Sea-level, = 29.780
Highest Reading, corrected for Index error, on the 5th, = 30.350
Lowest Do. Do. on the 22nd, = 28.432
Difference, or Monthly Range, = 1.918

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6th, = 58.4
Lowest in Month, corrected for Index errors, on the 23rd, = 28.3
Difference, or Monthly Range, = 30.1
“Corrected Mean” of all the Highest, (Col. 5), = 52.5
“Corrected Mean” of all the Lowest, (Col. 6), = 38.7
Difference, or Mean Daily Range, = 13.8
“Calculated Mean Temperature of Month, = 45.6

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 6th, = 58.4
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 52.5
Lowest at Night, Black Bulb, (corrected for Index errors), on the 23rd, = 28.3
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 38.7
Difference of above Means or Range (“exposed”), = 13.8

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), = 44.6
“Computed Temperature of Dew-Point,” = 43.2
“Do. Elastic Force of Vapour,” = 2.83
“Do. Weight of Vapour in a Cubic Foot of Air, ... = 93
“Relative Humidity, (Saturation = 100), ... = 93
RAIN fell on 15 Days; Amount in Inches, = 5.63

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.											
P.M.											
Mean.											

N.B.—The Sums to be correctly added and the Means deduced. Returns from the “Principal Towns” should be in Edinburgh not later than the 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

The Rev. J. Fettes College

(Signed)

James Blair

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

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

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

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and 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 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, by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers are not graduated on the stem, but merely on an attached scale, minute 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 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 Thermometer is enclosed in a tin case, which also supports the water-cup underneath. This arrangement must be immediately rejected by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the frame-enclosed hygrometers shall be completed with, as far as possible, the frame of the Thermometer. Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The readings ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—38.5, 40.0, or 40.1; or again, 40.4, 40.3, or 40.2, according as it indicates a little under, an exact coincidence with, or a little over 40° or 40.5° respectively. So also 44.3, and 44.7 or 44.8 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, their extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3d. are those of a series of phenomena commencing at 9 A.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 observations be made at every hour of the day. 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 Thermometer-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 gauges 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." 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 noted in every column, the observer cannot be too careful to register observations only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds' column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the observation; and so on. Observations of 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, cu-st., will indicate that the higher regions are covered to the "amount" of 4-tenths with stratus clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the cumulo-stratus kind. Sunshine.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column. Underground Thermometers.—As the germination and health of crops and plants greatly depend on the temperature of the soil—its amount and constancy—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

Ozone.—Mention whether Schindler's or Morf's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the 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+3, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4 + 1/2," that is it is blowing fresh. Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper observatory is necessary to every complete meteorological observatory.

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no 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 infixed 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. Remains ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable hills of snow, hail, or rain; the hour of on storms has been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

The Council recommend that term day observations be taken: viz., on the 21st days of March, June, September, and December. 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 1889.

BOOK-POST.

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

MR ALEXANDER BUCHAN,

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OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple,			Cuckoo,		
Bourtree or Elder,		Black Currant,			Curlew,		
Broom,		Cherry,			House-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Plover,		
Holly,		Peach,			Sand-Martin,		
Laburnum,		Pear,			Starling,		
Lilac,		Plum,			Swan,		
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.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Fettes College, County of Edinburgh, in Lat. _____, Long. _____, Distance from Sea 1 1/2 miles.
Height of Cistern of the Barometer above Mean Sea-level _____ feet, above Ground _____ feet. During the MONTH of November 187 3.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.		OZONE.		GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. P.M.		Readings of the H. Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.		9 h. P.M.		Temperature at 1 fathom and Density.	9 A.M.	9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
		Barometer. * No. _____	Atmospheric Thermometer	Barometer. No. _____	Atmospheric Thermometer	Max. No. _____	Min. No. _____	Max. in Sunways No. _____	Min. on Grass. No. _____	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	9 h. A.M.	Velocity (0-10), and Direction.			Amount (0-10), and Species.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	No. 3 inches.	12 inches.	No. 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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BAROMETER, "corrected Mean" at 9 A.M., $\frac{29.764}{29.764} = 29.764$
for Temp. (Col. 2), = $29.764 - .052 = 29.712$
"Corrected Mean" of Barometer at 9 P.M., $\frac{29.764}{29.764} = 29.764$
for Temp. (Col. 4), = $29.764 - .052 = 29.712$
Mean at Station, corrected, and at 32°, $\frac{29.712}{29.712} = 29.712$
Correction for height, feet above Mean Sea-level, = 138
Mean, reduced to 32°, and Sea-level, $\frac{29.712}{29.712} = 29.712$
Highest Reading, corrected for Index error, on the 16 th, = 30.500
Lowest Do. Do., on the 1 th, = 28.524
Difference, or Monthly Range, = 1.976

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 16 th, = 56.4
Lowest in Month, corrected for Index errors, on the 16 th, = 26.3
Difference, or Monthly Range, = 30.1
"Corrected Mean" of all the Highest, (Col. 5), = 48.5
"Corrected Mean" of all the Lowest, (Col. 6), = 37.2
Difference, or Mean Daily Range, = 11.3
** Calculated Mean Temperature of Month, = 42.8
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 1 th, = 56.4
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 56.4
Lowest at Night, Black Bulb, (corrected for Index errors), on the 1 th, = 26.3
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 26.3
Difference of above Means or Range ("exposed"), = 30.1

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 42.0
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 40.8
Computed Temperature of Dew-Point, = 39.3
Do. Elastic Force of Vapour, = 2.41
Do. Weight of Vapour in a Cubic Foot of Air, = 2.76
Relative Humidity, (Saturation = 100), = 91
RAIN fell on 13 Days; Amount in Inches, = 2.66

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		2	3	6	0	1	0	14	4	0	1.87
P.M.		1	2	6	3	1	3	12	2	0	1.92
Mean.		2	3	6	1	1	2	13	3	0	1.90

Greatest daily range 25.0 on the 3rd
(Signed) _____



Observations made and Return verified by _____

WITH REMARKS ON THE USE OF INSTRUMENTS.

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 lighted 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 dissipation.

attached to the stem, and they are very liable to be moved from their position on the Scale, and the thermometer to be used without being *re-adjusted*. The self-righting thermometers, and especially the "*Marine*" Thermometers, sold frequently to be compared with the bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the bulb) ought to be tested once, in snow or melting ice.

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 ap-

paratus seriously vitiated the "Hermogenitean" Dothisian Observers, are specially requested to attend to the following conditions.—The bulls must *hang down* by at least an inch from the scales and frame to which they are attached by a strap, frame muscles, such will bring the flukes forward by an inch, from any board on which it may be suspended; the cap 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 to the frame, which also supplies it with water. It must not be so large as the chamber that the muslin will draw in and make the water level rise. Lastly, the

observation is a combination of *reflex*, *color*, and *translucence* made with great care. The pulp color is best observed by placing one's eye close to the surface of the crown, so that the reflection from the film of ice thus formed evaporation will proceed as from the top.

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

of *observed temperature*. The thermometer 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 test of indifference when the self-registering thermometer is read, since, in winter at least, the extremes may occur at any hour, and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the *3rd* are those of a series of phenomena commencing at 9 p.m. on the *2nd*, and extending till 9 p.m. on the *3rd*.

Wind.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction should be taken; and when it is stationary,

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

The Council would 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, the Anemometer may also be recommended,—the

Wind S Anemometer may also be recommended; if the method of *Estimating Wind Force* by such tables as that given in the *Handbook* is to be used, the *Beaufort* scale is the most satisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavorable situations of the instruments used. It is, indeed, difficult to obtain an unexpected position for the rain-gauge; but in all cases the gauge must be placed in the ground till its edges are on a level with the surface of the ground around its mouth. The rain-gauge ought to be placed in a level, open, and airy situation, and not in a place where the daily fall of A.W., and the readings entered in the returns of the day, *may be, for convenience*, be registered in the rain columns, under the following conditions:—When a snow shower occurs, it should 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 an 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 careful to register *precipitation* only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luch Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be ascertained by

BOOK POST.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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CROPS		Planting.		Sowing or		In Far		or	
mentioning variety.		above ground.		Flower.		or		or	
Barley,	• • •								
Oats,	• • •								
Wheat,	• • •								
Beans,	• • •								
Peas,	• • •								
Potatoes,	• • •								
Turnips,	• • •								
Rye Grass,	• • •								

[illegible]

OBSERVATIONS	FOREST TREES.	No.
	Alder,	.
	Ash,	.
	Beech,	.
	Birch,	.
	Elm,	.
	Larch,	.
	Pine,	.
	Oak,	.
	Sycamore or Plane,	.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

[illegible]

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

(By Order) A. B.

EDINBURGH, November 1873,

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Fettes College, County of Edinburgh, in Lat. _____, Long. _____, Distance from Sea _____ miles.

Height of Cistern of the Barometer above Mean Sea-level _____ feet, above Ground _____ feet. During the MONTH of December 1872.

The Hours of Observation are of Greenwich Time.

[illegible]

BAROMETER, “corrected Mean” at 9 A.M., <i>minus</i> the Correction $\left. \begin{array}{l} \text{for Temp. (Col. 2),} \\ \text{“Corrected Mean” of Barometer at 9 P.M.,} \\ \text{minus the} \end{array} \right\} =$	
for Temp. (Col. 2), =	
“Corrected Mean” of Barometer at 9 P.M., <i>minus</i> the Correction $\left. \begin{array}{l} \text{for Temp. (Col. 4),} \end{array} \right\} =$	
for Temp. (Col. 4), =	
Mean at Station, corrected, and at 32°,	=
Correction for height, feet above Mean Sea-level,.....	=
Mean, reduced to 32°, and Sea-level,	=
Highest Reading, corrected for Index error, on the th,.....	=
Lowest Do. Do., on the th,.....	=
Difference, or Monthly Range,	=

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

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

Difference, or **Monthly Range,** =

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

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

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

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

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

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

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, ... =** _____

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

[illegible]

Observations made and
Return verified by

(Signed) _____

OBSERVATIONS,

2

the greater or less obscuration of the sky *overcast* (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 should be noted among the *Remarks*.¹ The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overcast* is free from clouds it is entered 0, when *half covered* by clouds, 5 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 *clouds* and *lower* are made in the following manner:—In the column “Velocity and Direction,” 6 S. W.

2. W. *upper* strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{4}{5}$ st. will indicate that the higher

regions are covered to the "amount" of 4-fimbria with *stratus* clouds; and that the sky is further obscured to the extent of 2-clouds by lower clouds of the *nimbo-stratus* kind.

Snowline.—The number of hours in which 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 depths of 3, 12, and 23 inches, and the stems above ground protected from the sun's rays, and lined with sloping tin collars, to prevent rain water being conveyed to the bulbs by the stems or wooden frames. Mention should 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 boats 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.

Therefore we recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from boats, from the ends of piers and rocks round the coast, where it is not influenced by that river water. At or near the time of high water, on the 5th, 10th, 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.

Coast.—Mention whether Schimper's or Mollat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the 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 S.W., as *an one entry* in

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

Remarks.—The "Remarks" column is too narrow, but undeniably 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 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 colour of the sea.

[illegible]

Specimens should be entered in this manner on the side of the record book. The period of return of the birds is *Observations* may be made on the margin. *Observations* should not only give scientific names, but also the names of the birds, and the names of the persons who possess not only great scientific interest, but also a considerable interest to the Agriculturist. The Council would direct the special attention of the Observers to the registration of the phenomena so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term* any 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 observers, before purchasing new instruments, to 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.

EVANS, Secy. to the Council.

(By Order) A. B.

EDINBURGH, November 1873.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	Alder,	Ash,	Beech,	Birch,	Elm,	Larch,	Time,	Oak,	Scammore or Plang,
Flower.									
In									
Leaf buds									
First appear.									
In leaf.									
Divided of									
Leaves.									
Barley,									
Oats,									
Wheat,									
Beans,									
Peas,									
Potatoes,									
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Other,									
Barley,									
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Urnships, Frits, etc., whether plentiful, or in pettition; whether any have suffered from blight, disease, etc. Whether Epizootic disease prevails among cattle; and the Agricultural condition of the district generally.

[illegible]

BOOK POST

MR. ALEXANDER BUCHAN.

Secretary of the Meteorological Society of Scotland

EDINBURGH.

Leinburg
Dec 1873