

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Healish Larnach County of Highland, in Lat. _____, Long. _____, Height above Sea 183 feet.

Distance from Sea 3 miles.

During the MONTH of January 1880.

Days of Week.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		THERMOMETERS, under Ground.			TEMPERATURE OF SPRING OR WELL.	TEMPERATURE OF SEA.	OZONE.	ELECTRICITY.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, etc. Mention the hour at which these began and ended.	Days of Month.		
		7 ^h . A.M.		6 ^h . P.M.		PROTECTED.		EXPOSED.		7 ^h . A.M.		6 ^h . P.M.		7 ^h . A.M.		6 ^h . P.M.		h. A.M.										
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Highest in Air.	Lowest in Air.	Max. Black bulb in Sun.	Min. Black bulb during Night.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	1 to 10.	11 to 20.	21 to 30.								
		inches.		inches.															inches.									
	1	30.98	44	28.94	45	33	39.5			31.5	48.5	44	42	S.W.		S.W.										Partly cloudy and showery throughout.		
	2	30.95	43	29.20	44	34	36.5			31	48	42	41	S.W.		S.W.										Overcast with showers of sleet.		
	3	30.92	42	28.64	42	34	34			30	47	41	40	S.W.		S.W.										Cloudy with occasional rain throughout.		
	4	30.88	42	28.55	43	41	36			30.5	47	39	38	S.W.		S.W.										Overcast. Very heavy sleet at night.		
	5	30.85	41	28.40	41	39	34			30	46	39	38	S.W.		S.W.										Cloudy, heavy sleet. A.M. drizzle throughout.		
	6	29.85	38	29.59	38	39	30			30	46	35	35	S.W.		S.W.										Partly cloudy. Fine and mild for the day.		
	7	29.84	36	29.88	37	39	28			30.5	45	35	35	S.W.		S.W.										Uniformly overcast. Very fine throughout.		
	8	29.82	35	29.88	37	44	34			31	45	36	35	S.W.		S.W.										Partly cloudy. Fine and pleasant throughout.		
	9	29.80	35	29.84	38	37	31			31	45	36	35	S.W.		S.W.										Densely overcast. Drizzle throughout.		
	10	30.10	34	30.23	36	32	33.5			27	44	31	30	S.W.		S.W.										Thick drizzle early. A.M. slight haze.		
	11	30.24	33	29.93	35.5	34	23.5			25	44.5	30	35	S.W.		S.W.										Heavy clouds passing. Slight shower.		
	12	29.92	33	29.92	38	39.5	33			34	46	39	38	S.W.		S.W.										Cloudy. Fine. Mild. Day. Drizzle throughout.		
	13	29.95	39	29.93	39.8	40	35			34.5	46	38	37	S.W.		S.W.										Sun. Fine early. A.M. slight haze.		
	14	29.99	39	29.63	40	42	34			35	47	39	38	S.W.		S.W.										Partially overcast. Fine. Mild. Drizzle throughout.		
	15	29.25	42	29.20	44	52	34			36	44	43	40	S.W.		S.W.										Overcast. Windy with heavy showers of sleet.		
	16	29.45	40	29.19	39.8	44	30			33	43	39	36	S.W.		S.W.										Partially overcast. Squally at night.		
	17	29.84	38	29.80	38	35	30			33.5	43	34	33	S.W.		S.W.										Heavy clouds passing. Sun. Fine early.		
	18	29.60	36	29.58	36	36	28			31.5	40	34.5	32	S.W.		S.W.										Overcast. Cold and windy throughout.		
	19	29.44	36	29.28	34	37	30			33.5	33	36	33	S.W.		S.W.										Snowfall of 2 inches early. Drizzle overcast.		
	20	28.94	36	29.04	39	39	33			36	36	36	33	S.W.		S.W.										Cloud and wind settling. Sun. Fine early.		
	21	28.60	34	28.35	38	40	28.5			35	34	38.5	36.5	S.W.		S.W.										Very heavy showers of sleet. A.M. drizzle.		
	22	28.63	38	28.40	39	41	34			39	34.5	39	34	S.W.		S.W.										Dark clouds passing. Fine and mild for day.		
	23	28.85	35	28.38	38	37	31			34	34	36.5	35	S.W.		S.W.										Uniformly overcast with showers of sleet.		
	24	28.34	34	28.38	38	39	31			34	33	35.5	35	S.W.		S.W.										Snowfall of 3 inches. Heavy showers of sleet.		
	25	29.53	38	29.34	37	39	31			34	35	32.5	30	S.W.		S.W.										Overcast. With light sun. Fine early.		
	26	29.58	34	29.30	33	30	18			32	21	29.5	28	S.W.		S.W.										Partially overcast with cold lines.		
	27	29.20	35	29.60	34	35	33.5			33	22.5	27	24	S.W.		S.W.										Snowfall of 2 inches early. A.M. clear. Drizzle.		
	28	29.48	32	29.54	33	35	21			25.5	25	32	31	S.W.		S.W.										Uniformly overcast. Snowfall at night.		
	29	29.25	34	29.22	35	43.5	22.5			32	31	35	34.5	S.W.		S.W.										Overcast. Partly cloudy with fine intervals.		
	30	29.24	33	29.09	36	39	24			35.5	33	34	33	S.W.		S.W.										Densely overcast. Sleet showers at night.		
	31	29.43	35	29.48	34	33.5	26.5			32.5	30.5	29	24.5	S.W.		S.W.										Partly cloudy with fine intervals.		
	Sums.	10 17		10 17		10 17				10 17		10 17															Rain	
	Means.	29.32	37.8			39.4	30.8			35.3	38.4	34.2																
	Cor. for Index Errors.	+0.010		+0.060		-0.2	-0.2			-0.1	-0.2	+0.1	-0.2															
	Correction for Diurnal Range.																											
	Corrected Means.	29.38				39.5	30.6			35.4	38.6	34.0																
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

Barometer, mean corrected reading of Column No. 1 (A.M.),.....=

Column No. 3 (P.M.),.....=

Barometer, Highest observed reading of Month,.....= 30.040 on the 17th

Diameter of tube _____ inch; correction for capillarity to be added,.....+ 0.008

Capillarity,.....= +

Lowest do. do.,.....= 28.370 on the 27th

Sum,.....= 29.325

Difference, or Monthly Range,.....= 1.670

Correction for Temperature from Column No. 2 to be deducted,.....= 0.025

Temp. from Col. 4,.....=

Sum,.....= 29.300

Mean of the above= 29.360

Correction for Height above Sea-level, _____ feet, to add,.....= 0.201

Barometer corrected and reduced to 32° and Sea-level,= 29.564

Dry bulb Thermometer (mean of Cols. 9 and 11),.....= 35.4

Highest Reading Self-Registering Thermometer in Air and Protected,.....= 53 on the 17th

Wet bulb Thermometer (mean of Cols. 10 and 12),.....= 34.0

Lowest do. do.,.....= 18 on the 26th

† Dew-point Temperature,.....= 31.8

Difference, being Monthly Range,.....= 35.0

† Elastic Force of Vapour,.....= 1.80

Mean of Self-Registering Thermometers in Air and Protected,.....= 34.8

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

Mean Daily Range in Air and Protected,.....= 8.6

† Additional Weight required to Saturate a Cubic Foot,.....=

Greatest Daily Range, do.,.....=

† Degree of Humidity (Saturation 100),.....= 87

Highest Reading Self-Registering Black Bulb Thermometer in Sun,.....=

Lowest do. do. from Radiation during Night,.....=

(Signed) W. Thomson

(Designation) Barometer

N.B.—This Schedule should be returned (post-paid) as early as possible after the completion of the Month, with the Sums correctly added, and the Means deducted. No Wax or Wafers ever to be employed in closing the Schedule—the Gummed Corner to be alone used.

must be traced over the windmill, so as to form a thin film from the inside, the evaporation from the ice going on as from the chimney-windmill.

From Temp.—"A Floating's Rain Gauge," seem to possess several advantages over others: the Society gives the preference to them; but whatever form be employed, in order that all the stations may yield comparable results, it is recommended that the Gauge be fixed in the ground, so that the top of the receiver is nearly on a level with the top borders of *close cut grass* in a place as distant as possible from trees, hedges, high walls, and irregular or broken ground, and the quantity of *fall-snow*. If possible, the Gauge should be placed in a level, and the ground should be kept or kept daily. When more than one Rain Gauge is kept, they ought to be placed, near each other, but at different heights above the ground, and their indications noted in the *general remarks*, mentioning their height above ground—the regular column in the *Sketch* being reserved for the present Rain Gauge alone.

Winds.—Isolated White-runes or Weather-cocks are apt to give false indications of the general direction of the wind, in consequence of the currents of air at the surface of the ground being so much influenced by the neighborhood of hills, valleys, buildings, &c. Where low clouds are seen drifting along, their direction, in reference to known objects, or as noted by means of a mirror, on which a compass may be laid, or by means of a circular mirror, fixed over the centre of a pocket compass, will, in general, give the true direction of the current of air near the earth's surface; if these clouds are near and immediately overhead, that is, in or near the zenith of the observer. The motion of the higher strata of clouds gives no such indication. Failing the clouds, the general direction of the smoke of a hamlet or village, or of a tall chimney, gives a better indication of the general direction of the wind than any wind-vane. The observer should state whether he has ascertained the direction by reflection or otherwise. For mode of estimating the force of the wind, see "Directions for Reading Instruments;" but in all cases it is better to make use of Lind's Anemometer, as presented at Messrs Adie and Son's, and enter the greatest force of the wind during the period of observation.

Clouds.—The Society recommends observers to adopt the Howard nomenclature of clouds. The scale of cloud in the visible sky is reckoned from 0 to 10. Thus a sky quite free from cloud is 0; a sky half covered with cloud is 5; and the whole visible sky half covered with cloud is 10. Clouds often cover three-fourths or even more of the visible sky without obstructing the sunshining, so that the indications noted in the column for clouds would not necessarily express, or agree with, the column for sunshining. As the full moon, *so long as it is above the horizon*, is thought by some eminent astronomers to have a powerful effect in dispersing clouds, it would be well to note in the General Remarks any facts bearing on this point, for a few days (or nights, as the case may be) before and after every full moon; and the same observations might be made at the periods of new moon.

Sunshine.—The number of hours the sun shines during the day should be entered in the popular column.

Thermometers under Ground.—Though the temperature and hygrometric conditions of the air are those which chiefly influence the growth of crops, it is important that the soil itself should have for the germination of the seed, that the soil itself should have a certain temperature. To collect facts which may illustrate this, it is recommended to have Thermometers sunk 3, 12, and 25 inches below the surface of the ground, to ascertain the temperature of what may be named the agricultural soil; and the thermometer should enter in the Schedule the *kind of soil*; whether drained or undrained; and whether naturally wet or dry.

Temperature of the Sea.—As the meteorology of the island is incomplete without a knowledge of the mean temperature of the Ocean which surrounds it, the Society strongly recommends taking the temperature of the Sea at a depth of 6 fathoms from the end of all piers or rocks round the coast, where there from the influence of river water, and as near as may be about the time of high water. A thermometer, with its bulb fixed in a small tin tub, covered with a sloping lid, and with a weight attached, sunk to the required depth, and in ten minutes drawn up and read. Convenient instruments are furnished by Messrs Adie and Son.

Temperature of Springs.—The temperature of Springs or Deep Wells is recommended to be taken whenever practicable, mentioning whether Spring or Well, and its depth from the surface.

Meteors, Aurora Borealis, Remarkable Falls of Rain, Hail or Snow, Drifts of Ice, and Lightning, &c. should be specially noticed, together with the exact hour at which they were first seen, their continuance, and direction.

Barities, Tides, and Flowing of Tides.—It is necessary to bear in mind that the tides of the same species of tides differ widely in their times of ebbing and flowing. *Artificial* Tides or Springs of each kind should therefore be chosen (if possible early rains) and their indications should be alone noted—always the same from year to year when noticed.

Plants.—Mention when being noticed, or Modify the scale and papers are used. Specimens are to be preserved. They may be had at Messrs Adie and Son's, 56, Princes Street, and at Mr Bryson's, 60, Princes Street, Edinburgh.

Electricity.—Rain falls signified by a lightning threat, in connection with a metallic conductor, and under cover, and the degrees of a circle being used to express the degree of repulsion, form a clear and convenient Meteorometer. Exposed glass or sealing-wax ascertains the nature of the electricity.

must be poured over the wet bulb, so as to form a thin film of ice on the muslin, the evaporation from the ice going on as from the simply wetted bulb.

From Grazing—As Fanning's Rain Gauge seem to possess several advantages over others, the Society gives the preference to them; but whatever form be employed, in order that all the stations may yield comparable results, it is recommended that the Gauge be sunk in the ground so that the top of the receiver is nearly on a level with the top blades of *close cut grass*, in a place as distant as possible from trees, hedges, high walls, and impediments to the wind, and the quantity of Rain struck, if possible, be registered daily. When more than one Rain Gauge is kept, they are ought to be placed near each other, but at different heights above the ground, and their indications noted in the *upper remarks*, mentioning their height above ground—the regular column in the Schedule being reserved for the ground Rain Gauge alone.

It was suggested Wind-vanes of a earlier-dockers attempt to give false indications of the general direction of the wind, in consequence of the currents of air at the surface of the ground being so much influenced by the neighbourhood of hills, groves, buildings, etc. Where low clouds are seen drifting along, their direction, in reference to known objects, or as noted by means of a mirror, on which a compass may be laid, or by means of a circular mirror fixed over the compass of a pocket compass, will, in general, give the true direction of the current of air near the earth's surface. If these clouds are near and immediately overhead, that is, or near the zenith of the observer. The motion of the higher strata of clouds gives no such indication. Finding the clouds, the general direction of the smoke of a number of chimneys, or of a tall chimney, gives a better indication of the general direction of the wind than any wind-vane. The observer should save whether he has ascertained the direction by observation or otherwise. For notice of estimating the force of the wind, see Directions for Reading Instruments," but in all cases it is better to make use of Lind's Anemometer, as presented at Messrs Adie and Son's, and enter the greatest force of the wind during the period of observation.

Clouds—The Society recommends observers to adopt the Howard nomenclature of clouds. The scale of cloud in the visible sky is reckoned from 0 to 10. Thus a sky quite free from cloud is 0; a sky half covered with cloud is 5; and the whole visible sky covered with cloud is 10. Clouds often cover three-fourths or even more of the visible sky without obscuring the sunshine, so that the indications noted in the column for clouds would not necessarily express, or agree with, the column for sunshine. As the full moon, so long as it is above the horizon, is thought by some eminent astronomers to have a powerful effect in dispersing clouds, it will be to note in the General Remarks any facts bearing on this point, for a few days (or nights, as the case may be) before and after every full moon; and the same observations ought to be made at the periods of new moon.

Sunshine—The number of hours the sun shines during the

day, should enter into the proper condition of the soil, which, by its oblique influence on the growth of the crop, is so important for the health of the crop, and for the germination of the seed, that the soil itself should have a certain temperature. To collect facts which may illustrate this, it is recommended to have *Thermometers* sunk 3, 12, and 22 inches below the surface of the ground, to ascertain the temperature of what may be termed the agricultural soil; and the observations entered in the Schedule *the kind of soil*; whether drained or undrained; and whether naturally wet or dry.

Temperature of the Sea.—As the meteorology of the island is incomplete without a knowledge of the mean temperature of the Ocean which surrounds it, the Society strongly recommends taking the temperature of the Sea at a depth of 6 feet or 1 fathom from the end of all piers or rocks round the coast, where free from the influence of river water, and as near as may be about the time of high water. A thermometer, with its bulb fixed in a small tin bucket, covered with a stopper and, with a weight attached, can be pushed to the required depth, and be hauled down up and read.

Convenient instruments are furnished by Messrs Adie and Son. *Temperature of Springs*.—The temperature of Springs or Deep Wells is recommended to be taken whenever practicable, mentioning whether Spring or Well, and its depth from the surface. *Minerals, Anomalous Deposits, Remarkable Depression or Elevation of Barometery, remarkable Fossils of Run, Felt or Snow, Thunder of Lightning*, &c., should be specially noticed, together with the exact hour at which they were first seen, their continuance, and direction.

Bidding, seeding, and Mowning of Trees.—It is necessary to bear in mind that varieties of the same species of tree differ widely in their times of leafing and flowering. *Individual Trees or Shrubs* of each kind should therefore be chosen (if possible early kinds), and their indications should be alone noted—always the same plant from year to year being noted.

Quartz—Quartzion, whether Schönbein's or Adair's scale and papers are used. Schönbein's are preferred. They may be had at Messrs. Adie and Sons's 50, Princes Street, and at Mr. Blyth's 60, Princes Street, Edinburgh.

Wick-bag.—Pith balls suspended by a linen thread, in connection with a metallic conductor, and under cover, and the degrees of a circle being used to express the degree of repulsion, form a cheap and convenient. Electrometer. Exhaled glass or sealing-wax ascertains the nature of the electricity.

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Those persons who kindly furnish Monthly Tables of the Weather to the Spanish Meteorological Society are requested to attend to the following Instructions, seeing that one of their most important ends of Meteorological Observations is their being comparable with one another; and that for this purpose the requisites that all should, if possible, observe at a like hour, and in a like manner, and have their instruments placed, in so far as circumstances allow, in a like position.

Hour of Observation.—All instruments which are observed twice a day, should be read at the same hour morning and evening, in order to furnish upon results. The Society recommends *a quarter before one o'clock morning and evening*, as the most convenient hour; but should this be inconvenient, for the observer, another hour may be chosen, attending, however, to the above rule, that the evening and morning readings be taken at the same hour, and the hours entered on the Schedule.

Banerometer.—Barometers of Messrs. Adie and Son's construction are recommended; but any instruments may be used which have adjustable surfaces, and have been compared. Before this instrument is suspended for use it should be examined in order to ascertain whether the space above the mercury is free from air. This is done by touching the instrument somewhat from the vertical position, when, if free from air, the mercury will strike against the upper end of the tube with a sharp tap. The scale should be then completely fill the tube. If any air has got admittance, it should be driven into the stem by reversing the instrument, and tapping it gently with the hand. If it cannot be thus expelled, the instrument is useless till repaid.

The Bomeyer should be hung in a good light; and perfectly perpendicular, as ascertained by the plumb line; and it ought always to be gently tipped before taking the reading, to prevent adhesion of the mercury to the tube. In reading, the eye ought to be placed on the exact level of the top of the column of mercury. The reading of the attached Thermometer ought always to be taken, to the first tenth, as the heat of the breath, or the proximity of the observer, may, to a trifling extent, influence its readings.

The position of the apparatus was then applied to the Barometric method of making observations on the form of the instrument. The mode of making observations on the "Report of the Committee for the purpose," will be found in the "Report of the Committee of the Royal Society on Physics and Meteorology," 1840, page 18. The daily readings of the Barometer ought to be entered on the *Schedule of readings*. *Self-Registering Thermometers and Hygrometers*.—These should be placed alongside of each other, in a place freely exposed to the air, but protected from sunshine, and from reflected heat, as well as from radiation and from rain, and its near as may be *four feet* from the general surface of the ground. Different contrivances are used for this purpose, either a double ventilated box with louvered-slides, fixed at a north window, and projecting 12 inches from the wall, so as to allow a free current of air to pass between the box and the wall; or in a double meat-suet ventilated box with louvered-slides, fixed in an exposed place, and if possible over grass. Whatever means are finally adopted, the position of the instruments should be mentioned, and should not be changed, without the notice being given to the Secretary, in order that the results of one month's observations may be strictly comparable with those of another.

The *Sel. Indicating Thermometers* should be placed exactly horizontal. In case of the ordinary maximum Thermometer, with dry glass, or steel index, the bulb may be very slightly elevated in order that the mercurial column may be somewhat aided by the force of gravity in pushing forward the float or index; and in the case of the *minimum* Thermometer, the bulb must be slightly depressed to prevent a draining of the spirit to the top of the tube, and also that any part raised in vapour may return to the column. These Thermometers, if used once a-day, should *always be read on the readings*, so that the temperatures marked by the floats indicate the minimum and the maximum of the day on which the reading is taken. N.B.—The readings of the day instruments are taken from that extremity of the float which is nearest the head of the column of mercury of dry spirit.

The *maximum* Registering Thermometer, for taking the exact temperature of the sun's rays, should have its bulb blackened and the surface rendered dull, and it should be mounted in a blackened box, whose sides should be so high as to protect the bulb from wind. It should be so placed that the sun's rays have free access to it during the heat of the day.

The *mutuum* Registering Thermometry, for ascertaining the lowest temperature during the night from radiation, should have its bulb similarly blackened and rivetted dull, and be similarly mounted. It should be laid out, about sunset, over grass, in a place freely exposed to the sky, but raised on wooden supports a few inches above the surface, and removed during the day.

Hygrometer.—The *wet* bulb requires the mistin covering, it to often changed. In towns over a month, or oftener, if the

moisture to it should be previously soaked in a solution of washing soda, and then in pure water, before being attached, in order that it may be thoroughly wetted, else it will contract the moisture in its pores, and thus cause the wool to shrink. In frosty weather, water is better than steam, as the latter dries the wool too rapidly; moreover, and yield false results. The hair should be thoroughly wetted, and the cotton web, which contracts very much when being used; and the cotton web, which contracts very much when being used.

METEOROLOGICAL RETURNS.

18 1/2 And. Square
21, Rutland Street.

EDINBURGH.

DR STARK.

 T_6

METEOROLOGICAL RETURNS.

Turnips, rutabagas, etc., whether planted, or in perfection; whether any have suffered from blight, disease, etc. Hay, Potatoes, Whether

[illegible]

FOREST TREES.	In flower.	Leaf buds first appear.	In leaf.	Dressed or Leaves.	CROPS mentioning variety.	Sowing or Planting.	A peering or above ground.	In Ear.	First Out
Alder					Barley				First Out or Raised.
Ash					Bore or Bigger				
Beech					Oats				
Birch					Wheat				
Blm					Beans				
Larch					Pears				
Lime					Potatoes				
Oak					Turnips				
Sycamore or Plane					Rye Grass				

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith, County of Edinburgh, in Lat. _____, Long. _____, Height above Sea 182 feet.

Distance from Sea 3 miles. During the MONTH of February 1880.

Days of Week.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUD.	SUNSHINE.	THERMOMETERS. under Ground.			TEMPERATURE OF SPRING or WELL.	TEMPERATURE of SEA.	OZONE.	ELECTRICITY.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, etc. Mention the hour at which these began and ended.	Days of Month.				
		7 h. A.M.		6 h. P.M.		PROTECTED.		EXPOSED.		7 h. A.M.		6 h. P.M.		7 h. A.M.		6 h. P.M.		Days on which it fell.	Amount.			h. A.M.												
		Barometer.	Attached Ther- mometer	Barometer.	Attached Ther- mometer	Highest in Air.	Lowest in Air.	Max. Black bulb in Sun.	Min. Black bulb during Night.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.					3 inches.	12 inches.	22 inches.										
		inches.		inches.															lays.			inches.	1 to 10.	Hours.										0 to 10
	1	30.60	32.5	29.95	34	38.5	24			32	32	34	32	H.	16.6	H.	16.6												Passing clouds with fine intervals					
	2	29.85	33.5	30.12	34	38	28			30	29	34	32	H.	16.6	H.	16.6													Overcast. Clouds. Colours. Wind. Thunder.				
	3	30.10	34	29.94	35.5	40	26.5			32	31	39	38	S.W.	16	H.	16													Dark clouds passing with fine intervals				
	4	29.78	41.5	29.69	42.5	46	3.7			40	43.5	44	42	H.	16	H.	16														Overcast-Slight Showers of Rain. Thunder.			
	5	29.47	41.5	29.37	45	41	3.4			39	37	35	34	H.	16	H.	16														Passing clouds with sun. Slight showers.			
	6	29.43	37	29.46	36	38	28			32	29	33	31.5	H.	16.6	H.	16.6														Passing clouds with fine intervals			
	7	29.10	35	29.47	36	38	29			34	32	34.5	34.5	H.	16.6	H.	16.6														Overcast with snowfall. Thunder.			
	8	29.29	36.5	29.50	37	36	30			32.5	32.5	31.5	30.5	H.	16.6	H.	16.6														Snowfall. Slight showers. Thunder.			
	9	29.45	35	29.80	35	37	24			29	26	25	24	H.	16	H.	16															Passing clouds with fine intervals		
	10	29.83	35.5	29.83	32	33	18			29	27.5	29.5	28	H.	16.6	H.	16.6															Passing clouds with fine intervals		
	11	29.56	33	29.83	34	39	21			31	31	26	26	H.	16.6	H.	16.6															Uniformly overcast with cold wind		
	12	30.23	34	30.41	35	39.5	19.5			30	24.5	31.5	30	S.W.	16	H.	16															Snowfall early. Passing clouds		
	13	30.54	35	30.52	35	35.5	23			28	25	29	27	S.W.	16	H.	16															Slight showers of snow. Slight showers of rain		
	14	30.50	32	30.42	33	38.5	15			31	21	33	32	S.	16	H.	16															Snowfall of 3 inches early. Slight showers		
	15	30.37	34	30.23	36	43	28			37	34.5	39	36.5	H.	16.6	H.	16.6															Overcast with showers of snow		
	16	30.13	37	30.24	38	43	33			34	36	39	38	S.	16	H.	16															Dark clouds passing with bright intervals		
	17	30.34	37	30.30	38	40	29			36	34	36.5	34.5	S.	16	H.	16															Partly overcast. Slight showers		
	18	30.13	36.5	29.87	39	44	30			35	33	41	39	S.W.	16	H.	16															Passing clouds with fine intervals		
	19	29.27	39	29.25	38	43	27			34.5	34	38.5	35	H.	16.6	H.	16.6															Passing clouds. Slight showers. Thunder		
	20	29.24	35	29.40	36	38	27.5			32	31.5	36	32	H.	16	H.	16															Overcast with heavy rain		
	21	29.58	35	29.69	35	38	26			31	31	31	31	H.	16	H.	16															Passing clouds and squalls		
	22	29.74	34.5	29.72	35	40	22			29.5	29.5	37	34	S.W.	16	H.	16															Passing clouds with bright sun		
	23	29.75	37.5	29.76	41	46	31			40	39	40	38	S.	16	H.	16															Overcast. Passing clouds with fine intervals		
	24	29.70	40	29.74	41	42	37			38	37	40.5	38	S.	16	H.	16															Passing clouds. Slight showers. Thunder		
	25	29.57	41	29.37	42	44	38			42	40	43	40	H.	16.6	H.	16.6																Passing clouds with bright sun	
	26	29.25	42	28.67	43	49	34			43.5	40	43	41	S.W.	16	H.	16																Dark clouds passing with bright intervals	
	27	28.52	40.5	28.87	40	43	30			39	36	40	38	H.	16.6	H.	16.6																Slight showers. Heavy rain. Thunder	
	28	28.98	39	29.15	40	41	31			36	35	34.5	34	S.W.	16.6	H.	16.6																Slight snowfall early. Slight showers	
	29	29.60	37.5	29.70	39	42	32			37	35.5	36.5	34.5	S.W.	16.6	H.	16.6																Overcast with slight showers	
	30																																Dark clouds passing through	
	31																																	
	Sums.	20.8	191.5	21.16	27	1167	81.5			93.5	95.5	124	125																					
	Means.	29.717	36.6	29.733	37.5	40.2	28.1			34.0	32.5	35.3	34.0																					
	Index Errors.	+ .000		+ .000		+ .2	- .2			+ .1	- .2	+ .1	- .2																					
	Correction for Diurnal Range.																																	
	Corrected Means.					40.0	27.9			34.1	32.3	35.4	33.8																					
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27						

Barometer, mean corrected reading of Column No. 1 (A.M.),.....= 29.717 Column No. 3 (P.M.),.....= _____ Barometer, Highest observed reading of Month,.....= 30.540 on the 13th
Diameter of tube _____ inch; correction for capillarity to be added,.....+ _____ Capillarity,.....= + _____ Lowest do. do. do. = 28.520 on the 27th
Sum,.....= _____ Sum,.....= _____ Difference, or Monthly Range,.....= 2.020
Correction for Temperature from Column No. 2 to be deducted,.....= 0.02 Temp. from Col. 4,.....= _____
Sum,.....= 29.695 Sum,.....= _____
Mean of the above= 29.695
Correction for Height above Sea-level, _____ feet, to add,.....= 2.01
Barometer corrected and reduced to 32° and Sea-level,= 29.896

SUMMARY OF THE WINDS.										
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.	2	1	0	1	5	7	10	3		
P.M.	2	1	0	1	5	7	10	3		

Dry bulb Thermometer (mean of Cols. 9 and 11),.....= 34.1
Wet bulb Thermometer (mean of Cols. 10 and 12),.....= 32.3
† Dew-point Temperature,.....= 29.2
† Elastic Force of Vapour,.....= 161
† Weight of Vapour in a Cubic Foot of Air,.....= _____
† Additional Weight required to Saturate a Cubic Foot,.....= _____
† Degree of Humidity (Saturation 100),.....= 81
Highest Reading Self-Registering Thermometer in Air and Protected,= 49.0 on the 26th
Lowest do. do. do. = 15.0 on the 14th
Difference, being Monthly Range,.....= 34.0
Mean of Self-Registering Thermometers in Air and Protected,= 34.0
Mean Daily Range in Air and Protected,= 12.1
Greatest Daily Range, do.,= _____
Highest Reading Self-Registering Black Bulb Thermometer in Sun,= _____ on the _____
Lowest do. do. do. from Radiation during Night,= _____ on the _____

(Signed) Mr. Brown
(Designation) General

N.B.—This Schedule should be returned (post-paid) as early as possible after the completion of the Month, with the Sums correctly added, and the Means deducted. No Wax or Wafers ever to be employed in closing the Schedule—the Gummed Corner to be alone used.

1860
MR 87
A.B.K.

Dalkeith



To

DR STARK

Mr Burgess

Sec., Meteorological Society,

10, St Andrew Square

EDINBURGH.

METEOROLOGICAL RETURNS.

SHRUBS, ETC.		FRUITS.		MIGRATORY BIRDS.		First Departure.	
First in Blossom.		First in Blossom.		First in Blossom.		First in Blossom.	
Barberry,		Apple,		Cuckoo,			
Bourtree or Elder,		Black Currant,		Cinew,			
Broom,		Cherry,		House-Swallow,			
Hazel,		Gean,		Lapwing,			
Hawthorn,		Gooseberry,		Plover,			
Holly,		Peach,		Sand-Martin,			
Lilac,		Peary,		Starling,			
Mezereon,		Plum,		Swan,			
Mountain Ash or Rowan,		Strawberry,		Rail or Corn Crake,			
Rhododendron Ponticum,				Other Birds, naming them—			
Whin,							

FOREST TREES.		CROPS.		First Out.	
In Flower.		First in Blossom.		First in Blossom.	
Alder,		Barley,		First Out.	
Asch,		Bare or Bigg,		First Out.	
Beech,		Oats,		First Out.	
Birch,		Wheat,		First Out.	
Elm,		Beans,		First Out.	
Larch,		Pears,		First Out.	
Lime,		Potatoes,		First Out.	
Oak,		Turnips,		First Out.	
Sycamore or Plane,		Rye Grass,		First Out.	

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

INSTRUCTIONS FOR MAKING METEOROLOGICAL OBSERVATIONS.

Those persons who kindly furnish Monthly Tables of the Weather to the Scottish Meteorological Society are requested to attend to the following Instructions, seeing that one of the most important ends of Meteorological Observations is their being comparable with one another; and for this purpose it is requisite that all should, if possible, observe at a like hour, and in a like manner, and have their instruments placed, in so far as circumstances allow, in a like position.

Hour of Observation.—All instruments which are observed twice a-day should be read at the same hour morning and evening, in order to furnish mean results. The Society recommends a quarter before nine in the morning and evening, as the most convenient hour; but should this be inconvenient for the observer, another hour may be chosen, attending, however, to the above rule, that the evening and morning readings be taken at the same hour, and this hour entered on the Schedule.

Barometer.—Barometers of Messrs. Adie and Son's construction are recommended; but any instruments may be used which have adjustable surfaces, and have been compared. Before this instrument is suspended for use it should be examined, in order to ascertain whether the space above the mercury is free from air. This is done by inclining the instrument somewhat from the vertical position, when, if free from air, the mercury will strike against the upper end of the tube with a sharp tap. The mercury should then completely fill the tube. If any air has got admittance, it should be driven into the cistern by reversing the instrument, and tapping it gently with the hand. If it cannot be thus expelled, the instrument is useless till repaired.

The barometer should be hung in a good light and perfectly perpendicular, as ascertained by the plumb line; and it ought always to be gently tapped before taking the reading, to prevent adhesion of the mercury to the tube. In reading the eye ought to be placed on the exact level of the top of the column of mercury. The reading of the attached Thermometer ought always to be the first taken, as the heat of the breath, or the proximity of the person, are apt to influence its readings.

The corrections necessary to be applied to the Barometric readings depend on the form of the instrument. The mode of making these corrections, and the tables employed for the purpose will be found in the "Report of the Committee of the Royal Society on Physics and Meteorology," 1840, price 1s. The daily readings of the Barometer ought to be entered on the Schedule as read off, and the corrections only applied to the mean for the month.

Self-Registering Thermometers and Hygrometers.—These should be placed alongside of each other, in a place freely exposed to the air, but protected from sunshine, and as near as may be four feet from the general surface of the ground. Different contrivances are used for this purpose, either a double ventilated box with louver-boarded sides, fixed at a north window, and projecting 12 inches from the wall, so as to allow a free current of air to pass between the box and the wall; or in a double meat-safe ventilated box with louver-boarded sides, fixed in an exposed place, and if possible over grass. Whatever means are finally decided on, the position of the instruments should be mentioned, and should not be changed (without due notice being given to the Secretary), in order that the results of one month's observations may be strictly comparable with those of another.

The *Self-Registering Thermometers* should be placed exactly horizontal. In the case of the ordinary *maximum* Thermometer, with clay, glass, or steel index, the bulb may be very slightly elevated, in order that the mercurial column may be somewhat aided by the force of gravity in pushing forward the float or index; and in the case of the *minimum* Thermometer, the bulb must be slightly depressed, to prevent a draining of the spirit to the top of the tube, and also that any part raised in vapour may return to the column. These Thermometers, if read once a-day, should always be read on the evening, so that the temperatures marked by the floats indicate the minimum and the maximum of the day on which the reading is taken. N.B.—The readings of these instruments are taken from that extremity of the float which is nearest the head of the column of mercury or of spirit.

The *maximum* Registering Thermometer, for taking the extreme heat of the sun's rays, should have its bulb blackened and the surface rendered dull, and it should be mounted in a blackened box, whose sides should be so high as to protect the bulb from wind. It should be so placed that the sun's rays have free access to it during the heat of the day.

The *minimum* Registering Thermometer, for ascertaining the lowest temperature during the night from radiation, should have its bulb similarly blackened and rendered dull, and be similarly mounted. It should be laid out, about sunset, over grass, in a place freely exposed to the sky, but raised on wooden supports a few inches above the surface, and removed during the day.

Hygrometer.—The wet bulb requires the muslin covering it to be often changed. In towns once a month, or oftener, if the weather is dusty, and the muslin gets foul; in the country, whenever the muslin seems to be foul. The bulb should be covered with thin tissue or blotting paper below the muslin, and the muslin should always be thoroughly wrung, and freed from starch, before being used; and the cotton wick which conducts moisture, it should be previously soaked in a solution of washing soda, and then in pure water, before being attached, in order that it may be thoroughly wetted, else it will conduct the moisture imperfectly, and yield false results. In frosty weather, water

must be poured over the wet bulb, so as to form a thin film of ice on the muslin, the evaporation from the ice going on as from the simply wetted bulb.

Rain Gauge.—As "Fleming's Rain Gauge" seem to possess several advantages over others, the Society gives the preference to them; but whatever form be employed, in order that all the stations may yield comparable results, it is recommended that the Gauge be sunk in the ground, so that the top of the receiver is nearly on a level with the top blades of close cut grass, in a place as distant as possible from trees, houses, high walls, and irregular or broken ground, and the quantity of Rain should, if possible, be registered daily. When more than one Rain Gauge is kept, they ought to be placed near each other, but at different heights above the ground, and their indications noted in the general remarks, mentioning their height above ground—the regular column in the Schedule being reserved for the ground Rain Gauge alone.

Winds.—Isolated Wind-vanes or Weather-cocks are apt to give false indications of the general direction of the wind, in consequence of the currents of air at the surface of the ground, being so much influenced by the neighbourhood of hills, valleys, hedges, etc. Where low clouds are seen drifting along, their direction in reference to known objects, or as indicated by means of a mirror on which a compass may be laid, or by means of a circular mirror fixed over the centre of a pocket compass, will, in general, give the true direction of the current of air near the earth's surface; if these clouds are near and immediately over head, that is, in or near the zenith of the observer. The motion of the higher strata of clouds gives no such indication. Failing the higher chimney, gives a better indication of the general direction of the wind than any wind-vane. The observer should state whether he has ascertained the direction by reflection or otherwise. For mode of estimating the force of the wind, see "Directions for Reading Instruments," but in all cases it is better to make use of *Lund's Anemometer*, as preferred at Messrs. Adie and Son's, and enter the greatest force of the wind during the period of observation.

Clouds.—The Society recommends observers to adopt the Howard nomenclature of clouds. The scale of cloud in the visible sky is reckoned from 0 to 10. Thus a sky quite free from cloud is 0; a sky half covered with cloud is 5; and the whole visible sky covered with cloud is 10. Clouds often cover three-fourths or even more of the visible sky without obstructing the sunshining, so that the indications noted in the column for clouds would not necessarily express, or agree with, the column for sunshining. As the full moon, so long as it is above the horizon, is thought by some eminent astronomers to have a powerful effect in dissipating clouds, it would be well to note in the General Remarks any facts bearing on this point, for a few days (or nights, as the case may be) before and after every full moon; and the same observations ought to be made at the periods of new moon.

Sunshine.—The number of hours the sun shines during the day should be entered in the proper column.

Thermometers under Ground.—Though the temperature and hygrometric conditions of the air are those which chiefly influence the growth of crops, it is important for the health of the crop, and for the germination of the seed, that the soil itself should have a certain temperature. To collect facts which may illustrate this, it is recommended to have Thermometers sunk 3, 12, and 22 inches below the surface of the ground, to ascertain the temperature of what may be termed the agricultural soil; and the observer should enter in the Schedule the kind of soil; whether drained or undrained; and whether naturally wet or dry.

Temperature of the Sea.—As the meteorology of the island is incomplete without a knowledge of the mean temperature of the Ocean which surrounds it, the Society strongly recommends taking the temperature of the Sea at a depth of 6 feet or 1 fathom from the end of all piers or rocks round the coast, where free from the influence of river water, and as near as may be about the time of high water. A Thermometer, with its bulb fixed in a small tin pichet, covered with a stopping lid, and with a weight attached, is sunk to the required depth, and in ten minutes drawn up and read.

Convenient instruments are furnished by Messrs. Adie and Son.

Temperature of Springs.—The temperature of Springs or Deep Wells is recommended to be taken whenever practicable, mentioning whether Spring or Well, and its depth from the surface.

Meteors, Aurora Borealis, Remarkable Depression or Elevation of Barometer, Remarkable Falls of Rain, Hail or Snow, Thunder and Lightning, etc., should be specially noticed, together with the exact hour at which they were first seen, their continuance, and direction.

Budding, Leafing, and Flowering of Trees.—It is necessary to bear in mind that varieties of the same species of tree differ widely in their times of leafing and flowering. *Individual* Trees or Shrubs of each kind should therefore be chosen (if possible early kinds), and their indications should be alone noted—always the same plant from year to year being noticed.

Notes.—Mention whether Schönbein's or Mott's scale and papers are used. Schönbein's are preferred. They may be had at Messrs. Adie and Son's, 50, Princes Street, and at Mr. Bryson's, 60, Princes Street, Edinburgh.

Electricity.—Pith balls suspended by a linen thread, in connection with a metallic conductor, and under cover, and the degree of a circle being used to express the degree of repulsion, form a cheap and convenient Electrometer. Ixoided glass or sealing-wax ascertains the nature of the electricity.

SCOTTISH METEOROLOGICAL SOCIETY.

75

Observations taken at *Dalnish Gardens*, County of *Highland*, in Lat. _____, Long. _____, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *March* 186

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. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 A.M.		P.M.		9 h. A.M.		P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	No.	Min.	No.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	No.	12 inches.	No.	22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
		Barometer.	Attached Thermometer.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.	No.	Min.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	g.	denotes meteor.
cl.	" cirrus.	ms.	" nimbus.
cl-cu.	" cirro-cumulus.	r.	" rain.
cl-s.	" cirro-stratus.	h. r.	" heavy rain.
cu.	" cumulus.	e. h. r.	" continued heavy rain.
cu-s.	" cumulo-stratus.	s.	" stratus.
d.	" dew.	sc.	" scud.
f.	" fog.	sl.	" sleet.
fr.	" frost.	sn.	" snow.
h.-fr.	" hoar-frost.	st. h.	" star halo.
h.	" haze.	sq.	" squall.
h. d.	" heavy dew.	sp.	" squall.
l.	" hail.	st.	" storm.
l.	" lightning.	ts.	" thunder-storm.
li. cl.	" light clouds.	w.	" wind.
li. sh.	" light showers.	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 + = *29.496*for Temp. (Col. 2), = *29.326*..... - *0.32*.....

"Corrected Mean" of Barometer at 9 P.M., minus the Correction + =

for Temp. (Col. 4), =

Mean at Station, corrected, and at 32°, = *29.496*Correction for Height, feet, above Mean Sea-level, = *207*Mean, reduced to 32°, and Sea-level, = *29.697*Highest Reading, corrected for Index error, on the 7 th, = *30.340*Lowest Do., Do., on the 31 th, = *28.540*Difference, or Monthly Range, = *1.840*S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 17 th, = *53.8*Lowest in Month, corrected for Index errors, on the 14 th, = *24.8*Difference, or Monthly Range, = *29.0*"Corrected Mean" of all the Highest, (Col. 5), = *45.4*"Corrected Mean" of all the Lowest, (Col. 6), = *31.5*Difference, or Mean Daily Range, = *13.9*** Calculated Mean Temperature of Month, = *38.4*

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

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

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

"Corrected Mean," (Col. 8), of Black Bulb, Min. on the th, =

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

HYGROMETER,

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Doonagh Garden, County of Wick*, in Lat. *53° 10' N.*, Long. *10° 30' W.*, Distance from Sea *2* miles.Height of Cistern of the Barometer above Mean Sea-level *183* feet, above Ground *183* feet.

The Hours of Observation are of Greenwich Time.

During the MONTH of *April* 186*6*

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.				SEA.	OZONE.	GENERAL REMARKS.	Days of Month.				
		9 h. A.M.		6 P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 P.M.		9 h. A.M.		6 P.M.		Readings of the F.C. Cup Anemometer, at 9 P.M.		9 A.M.		P.M.		9 h. A.M.		P.M.									
		Barometer.	Attach- ed Ther- mometer.	Barometer.	Attach- ed Ther- mometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	No.	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.	Amount (0-10), and Direction.	No.	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.					No.	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.
		Barometer.	Attach- ed Ther- mometer.	Barometer.	Attach- ed Ther- mometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.					No.	No.	No.	No.
		inches.		inches.																															
	1	28.62	45	28.80	47	49.5	35			47	43	40	38	S.		N.																			
	2	28.79	45	28.83	46	49	36			41	39	44	40	N.		N.																			
	3	29.05	43	29.24	46	52	30			40.5	39	49	44	S.W.		N.																			
	4	29.60	43	29.79	44	49	34			40	38	43	38	E.		E.																			
	5	29.95	43	29.90	45	48	32			39.5	36	43	39.5	E.		E.																			
	6	29.80	40	29.69	44	50	26			42	39	48	44	S.		E.																			
	7	29.58	44	29.42	47	54	33			47.5	43	50	43	S.		N.																			
	8	29.30	46	29.04	48	51	39			48	43	46	43	N.		N.																			
	9	29.10	42	29.19	44	46	32			38	35	40	38	N.		N.W.																			
	10	29.57	41	29.79	43	45	31			38	34	39	35.5	N.		N.																			
	11	29.94	40	29.92	42	47	28			41	38	41	36	S.W.		E.																			
	12	29.93	40	29.84	44	51	26			40.5	37	47	42	E.		E.																			
	13	29.87	44	30.00	45	46	37			41	40	40.5	40	N.E.		E.																			
	14	30.17	43	30.21	44	47	30			40	38.5	43.5	39	N.E.		E.																			
	15	30.24	43	30.20	46	53	34			44	41	47	44	S.		E.																			
	16	30.30	45	30.32	47	57	38			45	43	43	40	E.		N.E.																			
	17	30.33	44	30.39	46	57	33			42	40	44	40.5	E.		E.																			
	18	30.29	45	30.27	47	49	37			43.5	40	43	38	N.E.		E.																			
	19	30.15	43	29.98	45	47	34			41	38.5	44	40.5	N.		N.																			
	20	29.87	42.5	29.75	41	46	36			38	35	41	35	N.		N.																			
	21	29.62	42	29.60	46	48	33			41	38.5	43	36	N.		N.E.																			
	22	29.60	41	29.58	46	50	29			41	36	43.5	39	N.E.		N.																			
	23	29.55	40	29.66	44	48	37			40	38	40	38	E.		N.E.																			
	24	29.77	43	29.85	45	48	33			40	38	40	38	E.		E.																			
	25	29.94	40	29.99	57	55	37			43	39	49	46	E.		E.																			
	26	30.07	44	30.08	48	57	31			46	43	46	42	E.		N.E.																			
	27	30.16	46	30.15	49	54	34			44	41	49	45	E.		E.																			
	28	30.13	46	30.03	52	63	30.5			47	42	56	46	S.E.		S.																			
	29	30.07	50	30.05	54	63	39			55	48	50	47	S.		S.E.																			
	30	30.18	55	30.25	55	58	44.5			52.5	50	55	52	S.E.		S.E.																			
	31																																		
	Sums.	412	1035	23	71	17	2558.9			87	5055	5435	5240																						
	Means.	29.781	43.5	29.790	46.5	50.8	33.0			42.9	39.5	44.8	40.8																						
	* Total Corrections for Instrumental Errors.	+0.069																																	
	* Corrections for Diurnal Range.																																		
	* Corrected Means.	29.850																																	
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction*
for Temp. (Col. 2), = *29.800*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction*
for Temp. (Col. 4), = *29.801*
Mean at Station, corrected, and at 32°, = *29.800*
Correction for Height, feet, above Mean Sea-level, = *2.07*
Mean, reduced to 32°, and Sea-level, = *30.001*
Highest Reading, corrected for Index error, on the 17 th, = *30.330*
Lowest Do., on the 1 th, = *28.520*
Difference, or Monthly Range, = *1.810*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for
Index errors), on the 28 th, = *63.0*
Lowest in Month, corrected for Index errors, on the 6 th, = *26.0*
Difference, or Monthly Range, = *37.0*
"Corrected Mean" of all the Highest, (Col. 5), = *50.8*
"Corrected Mean" of all the Lowest, (Col. 6), = *33.0*
Difference, or Mean Daily Range, = *17.8*
** Calculated Mean Temperature of Month, = *41.9*

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry
Bulb, = *43.8*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *40.2*
†† Computed Temperature of Dew-point, = *36.0*
†† Do. Elastic Force of Vapour, = *2.11*
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = *74*
RAIN fell on Days; Amount in Inches, = *0.46*

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

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

Observations made and
Return verified by

(Signed)

Wm Thomson Garden

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Barrow-in-Furness*, County of *Lancashire*, in Lat. *54° 45' N.*, Long. *3° 00' W.*, Distance from Sea *2* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *May* 186*7*

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.				CLOUDS.				SUNSHINE. Hours.	THERMOMETERS. under Ground.			SEA. Temperature at 1 fathom, and Density.	OZONE. 0-10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		Barometer, No.	Attached Thermometer	Barometer, No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction† = *29.670*
for Temp. (Col. 2), = *29.740* - *.070*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction† = *29.670*
for Temp. (Col. 4), = *29.740* - *.070*
Mean at Station, corrected, and at 32°, = *29.670*
Correction for Height, feet, above Mean Sea-level, = *209*
Mean, reduced to 32°, and Sea-level, = *29.879*
Highest Reading, corrected for Index error, on the 1 th, = *30.330*
Lowest Do., Do., on the 7 th, = *29.120*
Difference, or Monthly Range, = *1.210*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 21 th, = *76.0*
Lowest in Month, corrected for Index errors, on the 7 th, = *33.0*
Difference, or Monthly Range, = *43.0*
"Corrected Mean" of all the Highest, (Col. 5), = *63.1*
"Corrected Mean" of all the Lowest, (Col. 6), = *41.9*
Difference, or Mean Daily Range, = *21.2*
* Calculated Mean Temperature of Month, = *52.5*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index errors), on the 1 th, = *76.0*
"Corrected Mean," (Col. 7), of Black Bulb. Max. in Sun, = *63.1*
Lowest at Night, Black Bulb, (corrected for Index errors), on the 1 th, = *33.0*
"Corrected Mean," (Col. 8), of Black Bulb Min. on the 1 th, = *41.9*
Difference of above Means or Range ("exposed"), = *21.2*

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *54.0*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *49.5*
†† Computed Temperature of Dew-point, = *45.1*
†† Do. Elastic Force of Vapour, = *.299*
†† Do. Weight of Vapour in a Cubic Foot of Air, = *.72*
†† Relative Humidity, (Saturation = 100), = *72*

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		0	3	5	5	5	6	6	1		
P.M.		0	7	5	1	4	5	8	1		
Mean.		0	5	5	3	4	6	7	1		

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

Observations made and
Return verified by

(Signed)

Wm. Thomson

SCOTTISH METEOROLOGICAL SOCIETY.

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

The Hours of Observation are of Greenwich Time.

During the MONTH of *June* 186*0*.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.				CLOUDS.				THERMOMETERS.				SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 A.M.		P.M.		9 h. A.M.		P.M.									
		Barometer.	Atmospheric Thermometer.	Barometer.	Atmospheric Thermometer.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-6), and Direction.	Amount, (0-10), and Species.	Velocity (0-6), and Direction.	Amount, (0-10), and Species.	No. 3.	No. 12.	No. 22.	Temperature of Well, at Depth of feet, No.	Temperature at surface, and Density.	0-10.						
		# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.	# No.				
		inches.		inches.																													
	1	29.46	58	29.40	56	62	39			56	53.5	51	48	E		S.E.												Overcast fine mild showers throughout.					
	2	29.46	58	29.39	55	64	42			49	48	49	48	S.E.		S.E.												Gently overcast, thick mist A.M. showers P.M.					
	3	29.13	52.5	29.15	50	53	46			47.5	47.5	48	48	S.E.		E												Overcast, spitting rain throughout.					
	4	29.19	53	29.37	56	62	44			50	49.5	56	53	E		S.W.												Dark clouds passing, mild throughout.					
	5	29.37	55	29.45	57	64	47			59	55	57.5	53	S.W.		S.W.												Overcast and dull A.M. cloudy throughout.					
	6	29.55	58.5	29.53	58	64	48			56	52	55	51	S.W.		E.												Dark clouds passing, fine intervals.					
	7	29.49	58	29.50	58.5	57	45			51	50	49.5	49	S.E.		S.W.												Thunder between the hours of 12 and 1 P.M.					
	8	29.53	58	29.54	58	63.5	36.5			54	49	59.5	54	N.		N.												With heavy hail showers, rain in torrents.					
	9	29.55	58	29.50	58	63	42			51.5	50	59	55	S.W.		S.E.												Passing clouds, with fine intervals.					
	10	29.51	58	29.56	59	62	44			55	50	56	51	E.		S.E.												Overcast A.M. fine mild day throughout.					
	11	29.61	57.5	29.60	58	62	46			56.5	53.5	58	55	S.W.		S.E.													Mild showers A.M. cloudy throughout.				
	12	29.39	57	29.10	56	58	47			52	50.5	53.5	52	S.E.		S.E.													Thunder between the hours of 4 and 5 P.M.				
	13	28.97	56	29.03	58	64	46.5			56	53	55	51.5	S.E.		S.W.													Fine A.M. mild showers of rain P.M.				
	14	29.23	56.5	29.34	59	62	48			55	53	55	51	S.		S.W.													Gently overcast, showers of rain throughout.				
	15	29.45	57	29.50	60	67	47			57	52.5	60	55	S.		S.													Passing clouds, slight showers throughout.				
	16	29.59	57	29.60	60	66	44			55.5	52	60	56	E.		S.E.													Overcast cold winds throughout.				
	17	29.66	58	29.65	61	63	48			54	52	60	54	E.		S.E.													Passing clouds, with slight showers.				
	18	29.66	58	29.67	60	65	46			54	51	59	55	E.		S.E.													Thunder between the hours of 12 and 1 P.M.				
	19	29.67	57	29.60	61	69	41.5			54.5	52	61	57	E.		S.E.													Overcast and showery throughout.				
	20	29.59	59	29.53	63	69	50			57	52	62	59	E.		S.W.													Partially overcast, fine mild day.				
	21	29.55	60	29.59	64	70	46			57	55	63	56	S.W.		N.													Overcast A.M. bright sunshine throughout.				
	22	29.71	60	29.70	62	68	47			57	51	61	55	N.		S.W.													Thick fog A.M. overcast throughout.				
	23	29.40	63	29.64	64	70	49			61	58.5	55	59	S.W.		S.W.													Overcast fine mild day throughout.				
	24	29.86	59	29.84	63	74	47			60	55	62	55	S.W.		S.E.													Partially overcast, A.M. clear sky throughout.				
	25	29.44	56	29.34	60	67	47.5			56	54	52	51.5	S.E.		N.													Passing clouds, with fine intervals.				
	26	29.49	59	29.55	62	67	45.5			60	54	60	55	S.W.		S.W.													Thunder between the hours of 3 and 4 P.M.				
	27	29.45	60	29.38	64	68	51			58	55	63	54	S.		N.													Exceedingly fine day throughout.				
	28	29.33	59	29.38	63	66	45			58	54	60.5	54	N.		N.													Gently overcast, heavy showers throughout.				
	29	29.59	60.5	29.79	60	66.5	47			54	52.5	55	54	S.W.		S.													Fine A.M. cloudy and showery throughout.				
	30	30.01	57.5	30.08	64	68	43			54	47	64	58	N.		S.W.													Passing clouds, slight showers throughout.				
	31																													Overcast, slight showers throughout.			
																														Mild showers A.M. cloudy throughout.			
																														Partially overcast A.M. fine throughout.			
	Sums.	14. 57	205.5	15 20	284.5	146	165.5			155.5	62.0	219.5	107																				
	Means.	29.47	56.8	29.50	59.5	64.9	45.5			55.2	52.1	57.3	53.6																				
	* Total Corrections for Instrumental Errors.	+0.60		+0.30																													
	+ Corrections for Diurnal Range.																																
	"Corrected Means."	29.53		29.56																													
	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), = *29.481*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction* for Temp. (Col. 4), = *29.476*
Mean at Station, corrected, and at 32°, = *29.456*
Correction for Height, feet, above Mean Sea-level, = *20.9*
Mean, reduced to 32°, and Sea-level, = *29.479*
Highest Reading, corrected for Index error, on the 30 th, = *30.080*
Lowest Do., Do., on the 13 th, = *28.970*
Difference, or Monthly Range, = *1.040*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 24 th, = *74.0*
Lowest in Month, corrected for Index errors, on the 8 th, = *36.5*
Difference, or Monthly Range, = *37.5*
"Corrected Mean" of all the Highest, (Col. 5), = *64.9*
"Corrected Mean" of all the Lowest, (Col. 6), = *45.5*
Difference, or Mean Daily Range, = *19.4*
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 the th, =
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *55.2*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *52.1*
†† Computed Temperature of Dew-point, = *49.1*
†† Do. Elastic Force of Vapour, = *350*
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = *81*

RAIN fell on Days; Amount in Inches. =

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calms or Variable.
A.M.		0	3	8	4	3	7	4	1	
P.M.		0	5	2	6	2	9	5	1	
Mean.		0	4	5	5	2	8	4	1	

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

Observations made and Return verified by

W. Thomson
Gardener
Dalkeith Park

(Signed)

Note - our Rain gauge has got broke

SCOTTISH METEOROLOGICAL SOCIETY.

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

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.				CLOUDS.				THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.
		9 h. A.M.		6 4/10 P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 4/10 P.M.		9 h. A.M.		6 4/10 P.M.		9 A.M.		P.M.		under Ground.			Temperatures at 1 fathom and Densities.	9 A.M.	P.M.					
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.								
		† No.																														
		inches.		inches.																												
	1	30.10	61	30.13	67.5	70	45			63	57	69	61	S.W.	S.W.												Passing clouds with fine intervals	1				
	2	30.20	62	30.22	68	71	51			61	55	64	58	S.W.	H.												Exceedingly fine day throughout	2				
	3	30.20	64	30.12	66	69.5	51			64	57	59	56	S.W.	H.												Light clouds passing, windy throughout	3				
	4	30.00	64	30.10	68	72	52			64	59	63	57	H.	E.												Dull A.M. cloudy and windy throughout	4				
	5	30.12	66	30.04	70	74	48			66	60.5	69	62	H.	H.												Passing clouds with fine intervals	5				
	6	30.08	66	30.10	70	75	52			63	58	67	61	S.E.	E.												Light clouds passing, mild throughout	6				
	7	30.15	67	30.17	71	76	53			65	61	69.5	62	E.	E.												Uniformly overcast, sultry throughout	7				
	8	30.17	64	30.15	73	79	46			65	56.5	71	61	S.E.	S.E.												Densely overcast, very heavy dew P.M.	8				
	9	30.12	67	30.06	69	78	48			59	56	66	61	E.	E.												Overcast, mild with heavy dew P.M.	9				
	10	30.00	64	29.90	70	73	45			60	55	67	62	E.	S.E.												Overcast, fine mild day throughout	10				
	11	29.89	63	29.88	69	73	49			61	57	68	62	E.	H.												Uniformly overcast, sultry throughout	11				
	12	29.90	64	29.84	68	73	49			61	58	61	58	H.	S.E.												Densely overcast, slight haze P.M.	12				
	13	29.79	65	29.68	69	77	48			64	59	71	62	E.	S.												Overcast, windy, slight showers P.M.	13				
	14	29.47	65	29.54	67	73	55			60	57	63	57.5	S.W.	S.												Slight shower A.M. passing clouds throughout	14				
	15	29.55	65	29.57	69	74	51			64	60	70	61	S.	S.W.												Passing clouds, showery, windy throughout	15				
	16	29.75	65	29.79	67	70	49			66	61	64	61	S.W.	S.E.												Dark clouds passing, slight shower	16				
	17	29.75	64	29.73	68	72	52			65	61	67	58	E.	E.												Passing clouds with fine intervals	17				
	18	29.68	64	29.62	63	70	49			58	57	56	55.5	S.E.	S.E.												Densely overcast, spitting rain throughout	18				
	19	29.56	62	29.55	64	75	50			60.5	58	62	59	S.E.	S.W.												Overcast, heavy rain A.M. showery throughout	19				
	20	29.60	62	29.62	63	67	50			58	56	60	59	S.W.	S.E.												Passing clouds, slight showers throughout	20				
	21	29.63	61	29.66	62	64	46			58	54	55	53	S.W.	S.W.												Cloudy A.M. showery, densely overcast P.M.	21				
	22	29.66	60	29.64	64	72.5	49			57	54	61	57.5	S.W.	S.W.												Passing clouds with fine intervals	22				
	23	29.53	61	29.53	62	63	47.5			54	52	56	53	E.	S.W.												Showery A.M. cloudy throughout	23				
	24	29.72	59	29.82	61	63	46			55	50	55	52	E.	S.W.												Fine A.M. slight showers throughout	24				
	25	29.90	57	29.90	61	63	46.5			56	50.5	56	52	E.	E.												Densely overcast A.M. cloudy throughout	25				
	26	29.86	58	29.74	62	67	43			56.5	51	59.5	54	E.	H.												Fine A.M. uniformly overcast P.M.	26				
	27	29.60	60	29.55	64	68	47			62	57	59	56	H.	H.												Passing clouds, slight showers throughout	27				
	28	29.57	61	29.62	62	67	46			60	56	57	56.5	H.	E.												Fine A.M. very heavy rain P.M.	28				
	29	29.84	60	29.85	63	68	51			59.5	55.5	60	55	E.	S.W.												Uniformly overcast throughout	29				
	30	29.99	62	29.95	65	68	48			60.5	56.5	59	56.5	H.	H.												Overcast, fine mild day throughout	30				
	31	29.83	62	29.83	64	69	50			62	57	61.5	57	H.	S.W.												Densely overcast, A.M. cloudy throughout	31				
Sums.		2621	85			24	273			27	2025																					
Means.		29.845	62.7			708	48.8			60.9	56.5																					
* Total Corrections for Instrumental Errors.		+ .050		+ .020																												
† Corrections for Diurnal Range.																																
"Corrected Means."		29.905																														
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
cl.	" cirrus.	ms.	" meteors.
cl.-cu.	" cirro-cumulus.	n.	" nimbus.
cl.-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 haze.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	sp.	" spail.
li.	" lightning.	t.	" thunder.
li. cl.	" light clouds.	t.-s.	" thunder-storm.
li. sh.	" light showers.	w.	" wind.
li. co.	" lunar corona.	g.	" gale of wind.
li. lu.	" 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	Howling gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction† for Temp. (Col. 2), = *29.814*"Corrected Mean" of Barometer at 9 P.M., minus the Correction† for Temp. (Col. 4), = *29.814*Mean at Station, corrected, and at 32°, = *29.814*Correction for Height, feet, above Mean Sea-level, = *209*Mean, reduced to 32°, and Sea-level, = *30.023*Highest Reading, corrected for Index error, on the *2*th, = *30.220*Lowest Do., Do., on the *14*th, = *29.470*Difference, or Monthly Range, = *0.750*S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *8*th, = *79.0*Lowest in Month, corrected for Index errors, on the *26*th, = *43.0*Difference, or Monthly Range, = *36.0*"Corrected Mean" of all the Highest, (Col. 5), = *70.8*"Corrected Mean" of all the Lowest, (Col. 6), = *48.8*Difference, or Mean Daily Range, = *22.0*"Calculated Mean Temperature of Month, = *59.8*

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 _____th, Black Bulb, (corrected for Index errors), on the _____th, = _____

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *60.9*Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *56.5*†† Computed Temperature of Dew-point, = *52.7*†† Do. Elastic Force of Vapour, = *4.55895*

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

†† Relative Humidity, (Saturation = 100), = *75*

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

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

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

Observations made and
Return verified by

(Signed)

Mr. Thomson Gordon

Dalkeith
July 1860

duration 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 shape of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the *Remarks*.³ 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 80 on.

Observations of the clouds were made at 9 A.M. and at sunset as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 6 S.W. $\frac{1}{2}$ " (for example) will indicate that the upper part of clouds travel with extreme velocity from S.W. $\frac{1}{2}$ W. and those in the lower regions from W., with one-third (*acrotene*) speed of the former. Again in the second "Cloud" column, an entry of $\frac{4}{8}$, $\frac{st.$, 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.

column, an entry of $\frac{4}{2}$, cu-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.

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, 12th, and 22d 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 the observation; and continuing to observe for particular depths.

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

Ozone.—Mention whether Schönbein's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—this $\frac{35.4}{10}$, as

with a *2.020* entry in the *synonymy*, with *intensity* that the ozone paper is tinted as '3' on the scale, that the wind is from the N.W., that the sky is '4' on the scale, that the wind is from the N.W., that its force on the scale 0—6 is '4.5', i.e., that it is *blowing fresh*. Boxes of Papers may be used at the Society's Office. *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 magnetometer is necessary to every complete meteorological observatory.

Remarks.—The "*Remarks*" column is too narrow, but unavoidable so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such is to be recognised and in use at Greenwich and Southampton are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks

ought to be made on the occurrence of mists, anemone boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of the day, the direction and force of the wind, as well as such notes in terms of wind attaining their maximum, as well as such notes in terms of storms have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns otherwise unoccupied, or in two ruled off, for the convenience that

ended "Remarks." It is intimated that observations by the electronic survey can be entered in this manner, or the side margin. Additional remarks may be made on the margin. "Observations" in connection with the periodic return of the "Remarks" assess not only great scientific value, but are of considerable interest to the Naturalist. The Council would direct a special attention of Observations to the vegetation of such phenomena; that the published Summaries may fairly represent the whole of Sweden. Observations ought to be confined to individual trees and stands; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year.

The Council received a piece of ground on 10th March. The Council recommended that *tema-day* observations be taken; viz., on the 21st days of March, June, September, and December. For these latter observations separate schedules will be furnished to observers.

Full directions for the use of the instruments mentioned above will be had along with them from the officers.

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

(By Order.) A. H. B.
Ensign, 24th Feb. 1860.

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the objects of immediate importance, that the Society of Meteorological Observers 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 Observatories; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incompatible, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will, by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labor 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.

instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will, by a scrupulous attention to the following Directions secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comprehensiveness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

How of Observation.—The Council recommend that Observations be made precisely at the Council, (Greenwich or Railway Time only), twice a-day for some, and once, (morning or evening), for the 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 required to mark opposite every reading at what time it was taken, if not at 9 o'clock.

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

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

An excellent Barometer constructed by Mr. Adie of London for the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its *scale-marks* are not true, 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 same Barometer, the scales of the cistern are of leather, thus, by

The mercury can be adjusted to the *zero-point* of the fixed scale; 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; while their co-ordinates being indicated by a little ivory float, whose thin edges pass freely through the lid and case of the astern. 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 such approximations accuracy as a slight

When a Barometer having adjustable scales has to be removed from its fastenings, the ivory peg must be screwed up as to form a tight plug to the stem. 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 stem 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 stem, 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 *triple* which may be improved by putting a piece of white paper behind the glass. It must be perfectly perpendicular, and exposed to neither Sun's direct rays, nor the heat of a fire.

In taking an *Observation*, the attached Thermometer is inserted into the tube must then be gently tapped and the adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the text—usually the lower edge of the vernier, which must be perfectly adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken frequently; so as to prevent loss from the observer's hands and forearm from affecting the instrument. The use of a lens will greatly increase the accuracy of measurement, and readers of the *Banquet*.

Distribution of Thermopistors.—The Council of the Society recommended that Self-Recording Thermopistors and Hygrometers be enclosed in a Box, painted in an opaque and black within, and fixed a foot above the floor in an exposed position, free from draughts, and so placed as to be accessible to the hands of the attendants, and to avoid complete ventilation of the interior. The Thermopistors are arranged so as to be "pegged" in the Thermometers, and to show a complete reading of the interior. The instruments are suspended on cross-rids, in the centre of the room, and face the door opening to the north. To accommodate the instruments in the most desirable manner, doors are to be kept open to the north, and closed to the south, and the Thermopistors to be open to the south. These boxes may be made at the

Self-Regulating Thermometers.—Professor Phillips, and Neumann and Zambra's Patent "*Maximam*" Thermometers are recommended; pivoted devices for their use may be obtained with this instrument. The "*Minimum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximam*." This Thermometer is liable to two demerits, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it will be recomited by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the lower bowl, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must always be perfectly horizontal; the bulb end should incline slightly upwards, rather than the other.

Exanthematous disease prevails among Cattle; and the Agricultural condition of the district generally. Whether any have suffered from blight, disease, etc. Worth

[illegible][illegible]

FRANKFURT, 24th Feb'y 1860.

(By Order.) A. H. B.

ture of deduction or inference.

indeed in every column, the observer cannot be too careful to register *observations only*: and nothing that varies of the

SCOTTISH METEOROLOGICAL SOCIETY.

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Observations taken at *Guthrie Gardens*, County of *Midlothian*, in Lat. _____, Long. _____, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *August* 1860.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.				SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		9 h. A.M.		6 7h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 7h. P.M.		9 h. A.M.		6 7h. P.M.		Readings of the B-Cup Anemo- meter, at 9 P.M.		No. of hours in which it fell.	Amount in inches. No.	9 A.M.		P.M.		No. 3 inches.	No. 12 inches.						No. 22 inches.	Temperature of Well at Depth of feet. No.	Temperature at 1 fathom, and Daily.	0-10. 9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
		Barometer. ↑ No.	Atmospheric Thermometer. No.	Barometer. No.	Atmospheric Thermometer. No.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No.	No.			Velocity (0-5), and Direction.	Amount (0-10), and Species.	Velocity (0-5), and Direction.	Amount (0-10), and Species.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction† for Temp. (Col. 2), = *29.403*"Corrected Mean" of Barometer at 9 P.M., minus the Correction† for Temp. (Col. 4), = *29.403*Mean at Station, corrected, and at 32°, = *29.403*Correction for Height, feet, above Mean Sea-level, = *20.9*Mean, reduced to 32°, and Sea-level, = *29.612*Highest Reading, corrected for Index error, on the 1 th, = *29.820*Lowest Do., Do., on the th, = *28.780*Difference, or Monthly Range, = *1.040*S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 16 th, = *70.0*Lowest in Month, corrected for Index errors, on the 27 th, = *37.0*Difference, or Monthly Range, = *33.0*"Corrected Mean" of all the Highest, (Col. 5), = *64.9*"Corrected Mean" of all the Lowest, (Col. 6), = *46.1*Difference, or Mean Daily Range, = *18.8*** Calculated Mean Temperature of Month, = *55.5*

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 the th, =

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *56.6*Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *53.3*†† Computed Temperature of Dew-point, = *50.2*†† Do. Elastic Force of Vapour, = *36.4*

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

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

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.	0	1	5	3	0	8	13	1			
P.M.											
Mean.											

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

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

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

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

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

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

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

Self-registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent *"Anemometer"* 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 *cistern* of spirit breaks, it may be resupplied by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be discoloured from thence, by heating that part over a lamp; the alcohol will evaporate, and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the *Minimum* Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing point of each Thermometer, (marked by a scratch on the tube), ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly-tested Thermometer may be had, on loan, by any observer, from the Meteorological 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 manila must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the manila is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be noted by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

Reading of the Hygrometer.—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°·4, 40°·0, or 40°·1; or again, 40°·4, 40°·3, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½, respectively. So also 40½, 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 a.m. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of difference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 a.m. on the 2nd, and extending till 9 p.m. on the 3rd.

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

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results. The Council would strongly recommend that every Observatory be furnished with a Hemispherical-Cup Anemometer, a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Zeroing* 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 schedule 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 noting that particles of the nature of delusion or inference.

Clouds.—Convenient abbreviations for Luke Howard's nomenclature, 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 noting that particles of the nature of delusion or inference.

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

Observations of the clouds are made at 9 a.m. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example), will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of 2, *cu-sc.* (*cu.*) 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.

Shadows.—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., 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 tides of river-water. At or near the time of high water, on the 15th, 18th, and 21st 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 bottom of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

Coma.—Mention whether Schönbein's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the 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 *g.w.*, as an *exome* entry in the schedule, will indicate that the ozone paper is tinted as 4° 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*. Boxes of Papers may be had at the Society's Office.

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 recommended 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 onset of wind attaining their maximum, as well as such notes on storms as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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

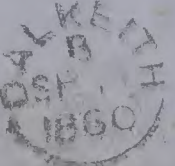
(By Order) A. H. B.

President, 24th Feb. 1860.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.				In Leaf.	Divested of Leaves.	CROPS mentioning variety.	Sowing or Planting.	Appearing or above ground.	In Bar or Flower.	First Cut	Alder,	Ash,	Beech,	Birch,	Elm,	Larch,	Pine,	Oak,	Sycamore or Plane,	
In Flower.	First appearance.	In Leaf buds.																		

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



Dalketh

To

Mr A. H. BURGESS,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.



SCOTTISH METEOROLOGICAL SOCIETY.

87

Observations taken at *Dalkeith Gardens*, County of *Midlothian*, in Lat. _____, Long. _____, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *188* feet, above Ground _____ feet.During the MONTH of *September* 1860.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 8 P.M.				HYGROMETER. No.				WIND.				RAIN.				CLOUDS.				THERMOMETERS, under Ground.				SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Readings of the H-Cup Anemo- meter, at 9 P.M.		No. of hours in which it fell.		Amount in inches.		Velocity, (0-6), and Direction.		Amount, (0-10), and Species.		Velocity, (0-10), and Direction.						Amount, (0-10), and Species.		Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom, and Density.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		Barometer. † No.	Atmospheric Thermometer. No.	Barometer. No.	Atmospheric Thermometer. No.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No.	Amount in inches.	Direction.	Force.	No.	Amount in inches.	Direction.	Force.	No.	Amount in inches.	Direction.	Force.					No.	Amount in inches.				Direction.	Force.	No.	Amount in inches.	Direction.	Force.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.	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), = *29.701*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = _____
Mean at Station, corrected, and at 32°, = *29.701*
Correction for Height, feet, above Mean Sea-level, = *20.9*
Mean, reduced to 32°, and Sea-level, = *29.910*
Highest Reading, corrected for Index error, on the 6th, = *30.150*
Lowest Do., Do., on the 14th, = *29.090*
Difference, or Monthly Range, = *1.060*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 6th, = *74.0*
Lowest in Month, corrected for Index errors, on the 25th, = *28.0*
Difference, or Monthly Range, = *46.0*
"Corrected Mean" of all the Highest, (Col. 5), = *59.3*
"Corrected Mean" of all the Lowest, (Col. 6), = *40.6*
Difference, or Mean Daily Range, = *18.7*
** Calculated Mean Temperature of Month, = *50.0*

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *52.0*

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *49.4*
†† Computed Temperature of Dew-point, = *46.7*
†† Do. Elastic Force of Vapour, = *1.320*
†† Do. Weight of Vapour in a Cubic Foot of Air, = _____
†† Relative Humidity, (Saturation = 100), = *82*

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.		3	3	1	2	1	11	8	1	0		
P.M.												
Mean.												

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 with 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 that the Tables published by the Society, an entire completeness, among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only), twice a-day for some, and once, (morning or evening), for other instruments, as specified, in the following remarks, 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, pay heed to this impossibility, 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. Neither can any Barometer be used for Meteorological Observations, unless it is supplied with such means of adjustment or compensation, as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a Standard.

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

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a 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 lightening 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 gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index;—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

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

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

The above remarks apply equally to the Thermometers for registering the greatest heat from the Sun's rays and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and primer's-silk. 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, 1½ inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the Sun's heat, to affect the alcohol by distillation. No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a Standard Thermometer. When such Thermometers are not graduated on the stem, but merely on an auxiliary 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 "Maximum" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing point of each Thermometer, (marked by a scratch on the tube), ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly-tested thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer. consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must hang down by at least an inch, free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board, of 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 instrument 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 observed by immersion from 15 to 20 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

Reading of the Hygrometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°·9, 40°·0, or 40°·1; or again, 40°·4, 40°·5, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40°·5, respectively. So also 40½°, and 40¾°, more or less, must be registered 40·2 or 40·3, and 40·7 or 40·8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

Winds.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observations, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain any 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 they are taken.

Snow-falls may, for-weathering, 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 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, recorded in every volume, the observer cannot be too careful to register observations only; and noting that particular nature of deduction or inference.

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

change of clouds will be found on the estimate. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e. within 90° or 100° of the zenith). The state of clouds should appear near the horizon as viewed obliquely; and this being unable to judge of their amount, we ought not to take them into account in the clouds column, though their appearance and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is half-covered by clouds, 5 is entered as the observation, and so on.

Observations of the clouds are made at 9 a.m. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, S.W. (for example) will indicate that the upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Clouds" column, an entry of 2, ⁴/₁₀, will indicate that the higher regions are covered to the "amount" of 4-tenths with stratus clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the cumulo-stratus kind.

Sunshine.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column. **Underground Thermometers.**—As the germination and health of crops and plants greatly depend on the temperature of the soil—its amount and consistency; the Council recommend that observations in this interesting department be made at 9 a.m., 12, and 22 inches, and the stems along 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 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 Schombert's or Mollat's papers are used. Mollat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 38°·5, 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. Boxes of Papers may be had at the Society's Office.

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 magnetometer is necessary to every complete meteorological observatory.

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

By the use of abbreviations, the state of the weather at 9 a.m. and 9 p.m. ought to be registered, either in two columns otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, on the side-margin. Additional remarks may be made on the margin. **Observations in connection with the periodic return of the seasons** possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, 40 specified sorts reared from year to year on a selected piece of ground or fann.

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

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the Secretary. The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should be able full power to reject any instrument that, on being presented for comparison, does not afford him satisfaction.

A. H. B. (The Observer.)

EDINBURGH, 24th Feb. 1869.

FOREST TREES.		FRUITS.		MIGRATORY BIRDS.		Other Birds, naming them.	
In flower.	Least buds first appear.	First in blossom.	First in fruit.	First in flight.	First in arrival.	First in departure.	First in arrival.
Alder.							Cuckoo.
Aspen.							Curlew.
Beech.							House-Swallow.
Birch.							Lapwing.
Elm.							Peewee.
Larch.							Swallow.
Pine.							Starling.
Yew.							Other Birds, naming them.
Sycamore or Plane.							

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

SHRUBS, ETC.		FRUITS.		MIGRATORY BIRDS.		Other Birds, naming them.	
First in blossom.	First in fruit.	First in blossom.	First in fruit.	First in flight.	First in arrival.	First in departure.	First in arrival.
Barberry.							Cuckoo.
Bourtree or Elder.							Curlew.
Broom.							House-Swallow.
Hazel.							Lapwing.
Laburnum.							Peewee.
Holly.							Swallow.
Mountain Ash or Rowan.							Starling.
Mezereum.							Other Birds, naming them.
Rhododendron.							
Whin.							

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

Dalkeith

Mr A. H. BURGESS,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.

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Height of Cistern of the Barometer above Mean Sea-level / 90 feet, above Ground 4 feet. During the MONTH of October 1864

The Hours of Observation are of Greenwich Time.

[illegible]

(Signed) *Mr Thomas Gardner*

Observations made and
Return verified by

WITH REMARKS ON THE USE OF INSTRUMENTS.

Self-Regulating Thermometers.—Professor Phillips, of Zambra's Patent "*Maximum*" Thermometers are recommended printed directions for their use may be obtained with the instrument. The "*Minimum*" Thermometer of Kuhlbrod is recommended when gauging on the glass stem and affixed to the frame separate from the "*Maximum*." This Thermometer is to two divergences, both of which must be gauged before use, and may be easily remedied by an observer. When the "*Minimum*" is used, the "*Maximum*" must be gauged by the use of spirit barrels, it may be resorted by striking the instrument repeatedly against the palm of the hand; when put in spirit distils by high temperature, it will be found in the tube, and must be dislodged from thence by heating that over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be held perfectly horizontal; the bulb end should incline slightly upwards, rather than the other.

ow on which the rain fell. The rain was registered in the rain gauge under the following conditions:—When a snow shower melted, it was noted in the "Remarks," and the letter S was written to the depth of water received in gauge. The depth of rain now must be measured in some open place where no drift occurred, and registered in addition to, and as a check upon, the measurements of the rain-gauge. For wind, rain, and snow, if any observations are made, the observer cannot be too careful to note them in every column, and nothing that partakes of the character of a deduction or inference.

Abbreviations.—Convenient abbreviations for Lake Howard's name.

(By Order,) A. H. B.
Clerk, 24th Feb. 1860.

FOREST TREES.	In flower.	First buds first appear.	In leaf.	Divested of leaves.	CROPS mentioning variety.	Sowing or planting.	Appearing or above ground.	In ear.	First cut.
Alder,					Bartley,				
Asb.,					Bore or Bigger,				
Beech,					Oak,				
Birch,					Wheat,				
Elm,					Beans,				
Larch,					Pears,				
Lim.,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plume,					Rye Grass,				

SHRUBS, ETC.		FRUITS.		MIGRATORY BIRDS.	
First in Blossom.	Barberry,	Apple,	First in Blossom.	Fruit Ripe Generally.	Cuckoo,
	Broom,	Cherry,			House-Swallow,
	Bouree or Elder,	Black Currant,			Cutew,
	Hazel,	Gamb,			Lapwing,
	Hawthorn,	Gooseberry,			Plover,
	Tolly,	Peach,			Sand-Martin,
	Laburnum,	Pear,			Swan,
	Linac,	Plum,			Rail or Corn Cuck,
	Mountain Ash or Rowan,	Strawberry,			Other Birds, naming them—
	Red Flowering Currant,				
	Rhododendron,				
	Whin,				

Epizootic disease prevails among Cattle; and the Agricultural condition of the district generally.

(By Order) A. H. B.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *De Lethbridge* County of *Midlothian*, in Lat. _____, Long. _____, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.

The Hours of Observation are of Greenwich Time.

During the MONTH of *November* 186*0*.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.				CLOUDS.				THERMOMETERS. under Ground.				SEA.	OZONE. 0-10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 A.M.		P.M.		9 h. A.M.		P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		Barometer. † No.	Attached Thermometer.	Barometer. No.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0-10), 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.	Temperature at depth, in feet.	Temperature at depth, in feet.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction† for Temp. (Col. 2), = *29.759*"Corrected Mean" of Barometer at 9 P.M., minus the Correction† for Temp. (Col. 4), = *29.759*Mean at Station, corrected, and at 32°, = *29.759*Correction for Height, feet, above Mean Sea-level, = *20.2*Mean, reduced to 32°, and Sea-level, = *29.968*Highest Reading, corrected for Index error, on the 7th, = *30.460*Lowest Do., Do., on the 15th, = *28.830*Difference, or Monthly Range, = *1.630*S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 1th, = *50.5*Lowest in Month, corrected for Index errors, on the 28th, = *22.0*Difference, or Monthly Range, = *28.5*"Corrected Mean" of all the Highest, (Col. 5), = *43.1*"Corrected Mean" of all the Lowest, (Col. 6), = *33.1*Difference, or Mean Daily Range, = *10.0*** Calculated Mean Temperature of Month, = *38.1*S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the 1th, = *50.5*"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *43.1*Lowest at Night, Black Bulb, (corrected for Index errors), on the 1th, = *22.0*

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

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

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

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

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its *scale-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 scales 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 *scale-time* on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this preliminary setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *zenith*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then 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 pegs, and gently tapping it; and if this plan fails, the instrument must be repaired. The Barometer should be suspended in a good *light*, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to neither the Sun's direct rays nor the heat of a fire.

In taking an Observation, the attached Thermometer is first noted; the tube must then be gently tapped and the cistern adjusted carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index—usually the lower edge of the vane, 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.

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

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

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 might never afterwards be used, without being re-tested. The self-registering, and especially the "Maximum" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing point of each Thermometer, marked by a scratch on the tube, ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly-tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and well-tested form of the 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 bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean and moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances. The frame of the Thermometers is enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the aforementioned requirements shall be complied with, as far as possible.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.9, 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, 40.5, more or less, must be respectively. So also 40.3, and 40.7, or 40.8, respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results. The Council would strongly recommend that every Observatory be furnished with a *Metaphysical-Cup Anemometer*, a self-registering instrument which shows the amount of Wind that passes in per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Reading Wind Force* by such tables as that given in the schedule is, to say the least, unsatisfactory.

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

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

Clouds.—Convenient abbreviations for Luke Howard's nomenclature have been printed, and may be had along with them from the makers.

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

(By Order) A. H. B.

Edinburgh, 24th Feb. 1860.

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of 2, ex-se, (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, evening 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 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.

Observations.—Mention whether Schönböck's or Moffat's papers are used—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 3 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3.4, as an *ozone* on the scale, will indicate that the ozone paper and that its force on the scale 0—6 is "4.2," i.e., that it is *blowing fresh*. Boxes of Papers may be had at the Society's Office.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory. **Remarks.**—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of nebulæ, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on the vicinity of an Observatory, the height of clouds and of the smoke 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 *ten-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council have agreed to recommend that observers, before publishing new instruments should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument that, on being presented for comparison, does not afford him satisfaction.

FOREST TREES.		FRUITS.		MIGRATORY BIRDS.		SHRUBS, &C.		SUNBDS, ETC.	
In Flower.	First in Blossom.	In Leaf.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.
Alder,		Barley,		Cuckoo,		Starling,		Barberry,	
Aspen,		Oats,		House-Swallow,		Swan,		Broom,	
Beech,		Wheat,		Curlew,		Starling,		Hawthorn,	
Birch,		Beans,		Sand-Martin,		Swan,		Holly,	
Elm,		Pears,		Starling,		Starling,		Laburnum,	
Larch,		Potatoes,		Swan,		Starling,		Lilac,	
Lime,		Rye Grass,		Starling,		Starling,		Mistletoe,	
Oak,		Trump,		Starling,		Starling,		Mountain Ash or Rowan,	
Sycamore or Plane,				Starling,		Starling,		Red Flowering Currant,	
				Starling,		Starling,		Rhododendron Koulencum,	
				Starling,		Starling,		Wine,	

CROPS.		FRUITS.		MIGRATORY BIRDS.		SHRUBS, ETC.		SUNBDS, ETC.	
In Flower.	First in Blossom.	In Leaf.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.
Alder,		Barley,		Cuckoo,		Starling,		Barberry,	
Aspen,		Oats,		House-Swallow,		Swan,		Broom,	
Beech,		Wheat,		Curlew,		Starling,		Hawthorn,	
Birch,		Beans,		Sand-Martin,		Swan,		Holly,	
Elm,		Pears,		Starling,		Starling,		Laburnum,	
Larch,		Potatoes,		Swan,		Starling,		Lilac,	
Lime,		Rye Grass,		Starling,		Starling,		Mistletoe,	
Oak,		Trump,		Starling,		Starling,		Mountain Ash or Rowan,	
Sycamore or Plane,				Starling,		Starling,		Red Flowering Currant,	
				Starling,		Starling,		Rhododendron Koulencum,	
				Starling,		Starling,		Wine,	

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

Mr A. H. BURGESS,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.

Dalmeith

To

Dalmeith

Mr 1860



DALMEITH

SCOTTISH METEOROLOGICAL SOCIETY.

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Observations taken at *Dalkeith Gardens, County of Midlothian*, in Lat. _____, Long. _____, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *December* 186*6*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.				CLOUDS.				THERMOMETERS.				SEA.	OZONE.	GENERAL REMARKS.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		9 h. A.M.		6 h. P.M.		Protected, in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom, and Density.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		Barometer. No.	Attached Ther- mometer.	Barometer. No.	Attached Ther- mometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H-Cup Anemo- meter, at 9 P.M.	No. of hours in which it fell.	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	SUNSHINE. Hours.				9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction[†] for Temp. (Col. 2), = *29.530*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction[†] for Temp. (Col. 4), = *29.565*
Mean at Station, corrected, and at 32°, = *29.546*
Correction for Height, feet, above Mean Sea-level, = *209*
Mean, reduced to 32°, and Sea-level, = *29.755*
Highest Reading, corrected for Index error, on the *15*th, = *30.080*
Lowest Do., Do., on the *8*th, = *28.860*
Difference, or Monthly Range, = *1.420*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *7*th, = *49.0*
Lowest in Month, corrected for Index errors, on the *24*th, = *-1.0*
Difference, or Monthly Range, = *50.0*
"Corrected Mean" of all the Highest, (Col. 5), = *36.9*
"Corrected Mean" of all the Lowest, (Col. 6), = *25.4*
Difference, or Mean Daily Range, = *11.5*
* Calculated Mean Temperature of Month, = *31.2*

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *32.6* *31.9*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *31.9* *31.4*
†† Computed Temperature of Dew-point, = *30.3* *30.3*
†† Do. Elastic Force of Vapour, = *17.2* *16.5*
†† Do. Weight of Vapour in a Cubic Foot of Air, = _____
†† Relative Humidity, (Saturation = 100), = *81* *92*

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

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

Observations made and
Return verified by

(Signed)

Mr. Thomson

P

Dalkeith
Decr. 1860

10, St Andrew Square,

EDINBURGH.

BOOK-POST.

[illegible][illegible]

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. Show must not be allowed to cover either of these Thermometers; nor the Sun's beams, to affect the alcohol by distillation.

Verification of Thermometers.—No instruments are to be used for Meteorological purposes that has not been carefully verified by comparison with a *Standard Thermometer*. When such Thermometers are *not* graduated on the stem, but merely on an attached scale, under-to repairs, they are very liable to be removed from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the *Wittmann's* 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 ley), ought to be tested once a year, in snow or melting snow. For comparison of Thermometers, a properly-tested Thermometer may be had, on loan, by any observer from the

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on the frame. As apparently slight deviations from the approved and well-*established* 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 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 point on which it may be suspended—the water-cup must be inverted, and placed to the side, and a little below the level of the bulb,—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the thumb, which also supplies it with water. It must be kept 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 coincided by immersion for 15 to 30 minutes before the hour of observation. From the film of the thus formed evaporation the bulb proceed as from the moist cloth in ordinary circumstances.

One kind of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which so supports the water cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the case, and hanging them side by side, so that the braced

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 to be taken to tenths of a degree, and noted in decimals, thus the thermometer will be read— $39^{\circ}.4$, $40^{\circ}.0$, or $40^{\circ}.1$; or $40^{\circ}.4$, $40^{\circ}.5$, or $40^{\circ}.6$, according as it indicates a little more or less than an exact centesimal writh, or a little over 40° , or $40^{\circ}.5$, respectively. So also $40^{\circ}.4$, and $40^{\circ}.5$ more or less, must be considered $40^{\circ}.2$ and $40^{\circ}.3$, and $40^{\circ}.7$ and $40^{\circ}.8$ respectively. In the following 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 carefully taken, being so readily affected by heat from the person who observes.

Hour of Observing Temperature.—The Hygrometer is read at 7 a.m. and 9 p.m. The self-registering Thermometers are read

9 p.m., as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of inference, but of fact, that the thermometers are read, since the winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence, to their proper meteorological periods. In the Society's schedules the indications registered on the 2nd, and extending till 9 p.m. on the 3rd.

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

Barometrical observations ought to be made on the changes in the position of the wind; and during storms, extra observations should be made at every hour of Greenwich time, such as

men of simultaneous observation, pursued at different Stations, will be likely to give highly interesting and important results. The Council would strongly recommend that every Observation be furnished with a Hemispherical Cup Anemometer — a self-registering instrument which shows the amount of Wind that passes in a set day; from which also the Velocity of the Wind at a time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, an Anemometer is also recommended; the method of *Zeigler's* Wind Force by small tables as that given in the schedule we say the least satisfactory.

reasonable surplus for the rain-gauge but in all cases the surplus must be sunk in the ground till edges are on a level with the close cut grass around its mouth. The rain-gauge must be set in a level place, and the readings entered in the returns as far as possible on the day on which the rain fell.