

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Hammerfield, (Lefanstone Road), County of Aberdeen, in Lat. 57° 8' 3" N, Long. 2° 7' 35" W, Distance from Sea 2 1/4 miles.
 Height of Cistern of the Barometer above Mean Sea-level 139 1/4 feet, above Ground 15 1/4 feet. During the MONTH of January 1874.
 The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	B.S. BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.				CLOUDS.				THERMOMETERS under Ground.				SEA.		OZONE.		GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms, including Thunder and Lightning, began and ended.		Days of Month.
		9 h. A.M.		9 h. P.M.		Protected in Shade, above Ground.		Exposed Black Bulbs, 9 h. A.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.								
		Barometer.	Atta- ched Ther- mometer.	Barometer.	Atta- ched Ther- mometer.	Max. No. 2233	Min. No. 107	Max. in Sun's rays No. 2237	Min. on Bulb No. 2237	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount inches. No. 2233	Velocity (M. P. H.) and Direction.	Amount (0-10). and Species.	Velocity (M. P. H.) and Direction.	Amount (0-10). and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.	No. 1 feet.	No. 2 feet.	No. 3 feet.	No. 4 feet.						
		No. 236	No. 236	No. 233	No. 107	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237	No. 237					
		inches.		inches.																																
	1	29.678	47.4	29.208	49.0	48.8	35.0	29.0	40.6	39.0	47.5	47.0	SW	1	SW	3	WSW	4	2	0.030											1					
	2	29.230	48.0	29.176	47.0	51.6	33.0	33.4	36.0	35.4	36.8	35.6	W	3	NW	3	WNW	4	2	0.095											2					
	3	29.228	47.0	29.038	47.0	37.7	29.1	27.9	33.3	32.6	30.7	29.2	SW	0.5	W	1	WSW	1.5	0	0											3					
	4	29.122	45.2	29.316	43.6	39.0	26.8	21.6	30.6	29.8	32.0	31.1	W	0.5	W	0.5	WSW	1	2	0.025											4					
	5	29.670	44.4	29.636	44.3	40.3	29.7	19.9	32.6	32.0	38.0	37.0	NW	1	W	1.5	WNW	2	0	0											5					
	6	29.690	46.7	29.790	48.0	46.3	36.1	25.6	43.2	40.4	45.0	41.7	W	1.5	SW	1	WSW	2	0	0											6					
	7	29.768	45.7	29.594	47.8	45.1	36.8	29.9	39.6	37.6	41.4	40.0	W	2	SW	2.5	WSW	3.5	6	0.083											7					
	8	29.472	47.0	29.281	47.3	43.0	38.8	37.4	40.3	39.8	43.0	42.6	S	2.5	SW	2	SW	4	10	0.180											8					
	9	29.396	49.2	29.670	49.0	46.3	37.1	38.1	42.8	40.3	38.9	37.8	NW	1	SW	1	WSW	2.5	0	0												9				
	10	29.844	48.6	29.894	47.6	42.3	31.0	28.6	36.2	35.3	34.7	33.0	SW	0.5	W	1	WSW	1.5	0	0												10				
	11	29.602	45.8	29.308	48.0	46.8	31.7	24.3	39.0	37.8	47.0	45.6	SW	3	SW	1.5	SSW	4	0	0												11				
	12	29.370	48.0	29.524	44.9	47.0	31.8	28.9	36.9	34.4	33.0	32.0	W	0.5	NW	1.5	WNW	2.5	0	0												12				
	13	29.672	43.8	29.358	47.0	45.6	30.7	26.3	32.2	31.9	44.7	41.1	W	1	W	1	WSW	1.5	0	0												13				
	14	29.412	47.2	29.564	48.0	45.7	33.0	28.2	38.7	36.7	36.7	35.0	W	1	W	1	WSW	1.5	3	0.045												14				
	15	29.280	49.3	29.212	52.3	53.0	31.7	29.5	45.1	44.7	47.7	47.0	SW	1.5	SW	2	SW	2.5	6	0.180												15				
	16	29.058	51.6	28.982	49.7	47.8	33.0	39.1	41.7	41.1	34.8	33.9	N	0.5	NW	0.5	WNW	2.5	8	0.250												16				
	17	29.126	48.7	29.428	49.5	40.0	30.0	24.7	31.9	31.4	33.9	31.9	SW	1	SW	1.5	SW	2	4	0.053												17				
	18	29.106	46.0	28.704	48.0	49.0	31.8	27.1	37.3	37.1	42.6	40.1	SW	1	NW	3	WNW	5	3	0.023												18				
	19	29.022	45.4	29.486	49.0	43.0	31.1	28.8	37.4	33.7	32.3	30.7	NW	2	NW	0.5	WNW	4	5	0.200												19				
	20	29.038	45.8	29.212	49.2	44.8	28.9	28.3	36.8	36.7	40.8	38.1	SW	1	NW	1.5	SSW	4	0 1/2	0.003												20				
	21	29.510	47.2	29.868	49.7	49.9	35.0	28.4	39.1	37.3	43.1	41.0	W	1	NW	1	WNW	2	0	0												21				
	22	29.900	50.3	29.850	50.3	49.0	40.0	24.3	45.9	42.3	42.3	40.7	SW	1.5	W	2.5	WSW	4	1	0.007												22				
	23	29.756	50.2	29.804	49.4	45.1	36.2	37.8	42.9	42.4	38.0	35.5	SW	0.5	SW	1	WSW	1.5	0	0												23				
	24	29.800	48.1	30.142	46.0	40.3	28.5	26.0	35.0	32.7	29.9	28.6	W	1	NW	1	WNW	1.5	2	0.003												24				
	25	30.068	46.0	29.870	45.8	42.6	26.1	23.2	31.0	30.6	40.6	39.3	SW	0.5	NW	1	WNW	1	0	0												25				
	26	29.764	50.8	29.966	52.7	53.0	39.3	29.6	32.8	48.4	42.8	40.1	W	1.5	NW	2.5	WNW	3.5	0 1/2	0.003												26				
	27	30.222	48.8	30.324	50.5	46.3	38.5	35.9	42.3	39.9	44.3	43.0	NW	1	NW	0.5	WNW	1.5	5	0.040												27				
	28	30.312	51.6	30.200	54.0	52.3	38.5	31.8	41.8	40.0	41.0	39.5	NW	1	var.	0.5	WNW	1	0 1/2	0.007												28				
	29	29.978	51.4	29.898	55.0	54.9	33.2	26.7	37.8	36.4	42.6	40.6	var.	0.5	NW	1	WNW	2.5	1	0.015												29				
	30	30.062	49.5	30.160	51.9	45.0	36.2	30.1	39.1	36.3	42.1	40.0	NW	1.5	NW	1	WNW	3	0	0												30				
	31	30.208	53.4	30.258	51.2	48.3	40.4	32.8	46.1	45.0	41.9	40.6	NW	0.5	NW	0.5	NW	2	0	0												31				
	Sums.	917.394	488.1	917.724	488.1	1512.7	1042.7	913.2	1206.0	1139.0	1230.1	1129.3	363	43.0					61 1/2	12.46																
	Means.	29.593	48.0	29.604	48.8	48.8	33.6	29.4	38.9	37.4	39.7	38.0	1.18	1.39					6.4	37.4																
	† Total Corrections for Instru- mental Errors.	-0.013		-0.013		+0.2	+0.1	-0.2	0	0	0	0	0.6	0.6																						
	† Corre- ctions for Diurnal Range.																																			
	"Cor- rected Means."	29.580	48.0	29.591	48.8	46.1	33.7	29.3	38.9	37.4	39.7	38.0	1.18	1.39					6.4	37.4																
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† for Temp. (Col. 2), = 29.528 *at level of*
 "Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 29.537 *at level of*
 Mean at Station, corrected, and at 32°, = 29.532 *29.574*
 Correction for height, 139 1/4 feet above Mean Sea-level, = +0.156 *+0.114*
 Mean, reduced to 32°, and Sea-level, = 29.688 *29.688*
 Highest Reading, corrected for Index error, on the 27th, = 30.311 *30.353*
 Lowest Do. Do., on the 18th, = 28.691 *28.733*
 Difference, or Monthly Range, = 1.620 *1.620*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 15th, = 53.8
 Lowest in Month, corrected for Index errors, on the 25th, = 26.2
 Difference, or Monthly Range, = 27.0
 "Corrected Mean" of all the Highest, (Col. 5), = 46.1
 "Corrected Mean" of all the Lowest, (Col. 6), = 33.7
 Difference, or Mean Daily Range, = 12.4
 ** Calculated Mean Temperature of Month, = 39.9
 S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 15th, = 2
 "Corrected Mean" (Col. 7), of Black Bulb, Max. in Sun, = 2
 Lowest at Night, Black Bulb, (corrected for Index errors), on the 5th, = 19.7
 "Corrected Mean" (Col. 8), of Black Bulb, Min. on grass, = 29.3
 Difference of above Means or Range ("exposed"), = 2
 Evaporation = 1.602 in.

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 39.3
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 37.7
 †† Computed Temperature of Dew-Point, = 35.6
 †† Do. Elastic Force of Vapour, = 0.209 in.
 †† Do. Weight of Vapour in a Cubic Foot of Air, = 2.41 lbs.
 †† Relative Humidity, (Saturation = 100), = 87.2
 RAIN: fell on 18 Days; Amount in Inches, = 1.246
Revised Sheet
 WIND. SUMMARY.
 Direction. N NE E SE S SW W NW Calm or Variable. Mean Force. Mean Velocity in miles per day.
 A.M. 1 0 0 0 1 11 10 7 1 118
 P.M. 0 0 0 0 0 9 9 14 1 139
 Mean 1 0 0 0 1 10 8 10 1 128 = 1.64 lbs.

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

Observations made and Return verified by Mr. Beveridge, assisted by Mr. Grant Murrell, Janitor, Grammar School, Aberdeen

Actual readings at Grammar School same days hours
 Highest 30.359 in.
 Lowest 28.753
 Range 1.606

Greatest daily range 18.6 on the 2nd
 (Signed) Mr. Beveridge

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

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

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

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

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

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *screw up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern upmost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument, so that the mercury strikes the top of the tube, a *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 fighting 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 *dry* place, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire.

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and floors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, Negretti and Zambra's Patent "Maximum" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Huttonford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two demerits, both of which must be guarded against, and may be easily remedied by an observer. When the *column of spirit breaks*, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

from radiation during night. Their bulbs have a black coating, which may easily be made or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulb from the wind. The "Maximum" 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 heat to affect the Minimum Thermometer by distillation.

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs—the mistin must be of medium thickness 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 mistin 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 13 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

Reading of the Thermometers.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite 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° .5, or .40° .6, according as it indicates a little under, an exact coincidence with, or a little over .40°, or .40° .5 respectively. So also .40° .3, and .40° .7, or .40° .8 respectively. In reading Rutherford's "Max" and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be as rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

The Council recommend that every observatory be furnished with a 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 *discriminating* 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.

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

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds' column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overhead is *half covered* by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example), will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{2}{3}$, (c.c.) 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 general trend 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 islands, 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 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 the wells ought, when practicable, to be taken, and the depths of the wells and of the water noted.

Ozone.—Mention whether Schönbein's or Mollat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3 s.w., as an ozone entry in the schedule, will indicate that the ozone paper is tinted as 4 3° on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4 2° 16," that it is *blowing fresh*.

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

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

Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms as 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 purposes, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks may be made on the side-margin.

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

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

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

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

ENPRINTED, 26th November 1859.

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

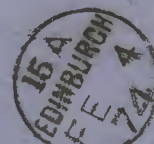
SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple,			Cuckoo,		
Bourtree or Elder,		Black Currant,			Curlew,		
Broom,		Cherry,			House-Swallow,		
Hazel,		Gean,			Lapwing,		
Hawthorn,		Gooseberry,			Plover,		
Holly,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

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

General Post Office Buildings,

Secretary of the Meteorological Society of Scotland,

MR ALEXANDER BUCHAN,



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Hammerfield, Belfair Street Road, County of Aberdeen*, in Lat. $57^{\circ}8'3''N$, Long. $2^{\circ}35'4''W$, Distance from Sea $2\frac{1}{2}$ miles.
Height of Cistern of the Barometer above Mean Sea-level $139\frac{1}{2}$ feet, above Ground $15\frac{1}{2}$ feet. During the MONTH of *February* 187*4*.

The Hours of Observation are of Greenwich Time.

ELEVATION.	Days of Month.	BAROMETER.						SELF-REGISTERING THERMOMETERS.						HYGROMETER.						WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.		OZONE.		GENERAL REMARKS.		Days of Month.							
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.			9 A.M.		9 P.M.											
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which fell.	Amount in inches.	Velocity (0-10).	Amount (0-10).	Direction.	Species.	Velocity (0-10).	Amount (0-10).	No. 1.	No. 2.	No. 3.	Temperature of Well at depth of feet. No.	Temperature at 1 fathom, and Density.	9 A.M.	9 P.M.										
		No. 236		No. 236		No. 233		No. 233										9 h. A.M.		9 h. A.M.		9 h. A.M.		9 h. A.M.		No. 1.			No. 2.			No. 3.										
		inches.		inches.		inches.		inches.										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
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		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
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		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
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		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
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		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
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		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
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		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.										
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		No. 236		No. 236		No. 233		No. 233										No. 1.		No. 1.		No. 1.		No. 1.		No. 1.			No. 2.			No. 3.							</			

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† for Temp. (Col. 2), = $29.775 - 0.052 = 29.723$
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = $29.758 - 0.052 = 29.706$
Mean at Station, corrected, and at 32°, = 29.712 29.754
Correction for height, $139\frac{1}{2}$ feet above Mean Sea-level, = $+0.156$ $+0.114$
Mean, reduced to 32°, and Sea-level, = 29.868 29.868
Highest Reading, corrected for Index error, on the 3rd th., = 30.431 30.473
Lowest Do. Do., on the 27th th., = 28.809 28.851
Difference, or Monthly Range, = 1.622 1.622

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 5th th., = 52.6
Lowest in Month, corrected for Index errors, on the 11th th., = 24.8
Difference, or Monthly Range, = 27.8
“Corrected Mean” of all the Highest, (Col. 5), = 46.5
“Corrected Mean” of all the Lowest, (Col. 6), = 33.4
Difference, or Mean Daily Range, = 13.1
* Calculated Mean Temperature of Month, = 39.9

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 11th th., = 21.6
Lowest at Night, Black Bulb, (corrected for Index errors), on the 11th th., = 29.5
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 29.5
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 29.5
Difference of above Means or Range (“exposed”), = 29.5

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 38.5
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 37.2
†† Computed Temperature of Dew-Point, = 35.4
†† Do. Elastic Force of Vapour, = 0.208 in.
†† Do. Weight of Vapour in a Cubic Foot of Air, = 9.418 grs.
†† Relative Humidity, (Saturation = 100), = 89.1
RAIN fell on 21 Days; Amount in Inches, = 1.372

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Caln or Variable.	Mean Force.
A.M.	2	1	0	2	2	19	1	1	0	1.11	
P.M.	0	1	0	1	2	13	1	8	2	1.16	
Mean.	1	1	0	2	2	16	1	4	1	1.135	1.29 lbs.

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

Observations made and Return verified by *Alex. Beverly, assisted by Sergt. Shoult*
Sanitar Grammar School, Aberdeen.

Actual readings at Grammar School
Highest 30.476
Lowest 28.851
Range 1.625

(Signed) *Alex. Beverly*
Greatest daily range = 23.2 on the 11^{th}

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

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

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for same, and once (morning or evening) for other times, as specified, in the following remarks, or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock. Barometer.—Weather glasses and aneroids, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of adjustment or compensation as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a Standard.

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its scale-inches are not true inches but so short as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale; when station 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 entire series.

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

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

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the box, and free the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These boxes may be had from the opticians, Negretti and Zambra's Patent "Maximum" Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks it may be re-unioned by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never after-wards 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 section on the tube) ought to be tested once a year, in snow or melting ice, for comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "Hygrometric Deductions" Observers are specially requested to attend to the following conditions:—

The bulbs must hang down by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs—the mesh must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the mesh is always clean and moist, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances. One form of "Nansen'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 frame and requirements shall be complied with as far as possible.

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

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

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

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

The Council recommend that every observatory be furnished with a Hemispherical-Cup Anemometer;—a self-registering instrument which shows the amount of Wind that passes it, day by 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.

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

Snowfalls may, for convenience, be registered in the rain columns, under the following conditions:—when a Snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as 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.

Clarks.—Convenient abbreviations for Luke Howard's

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 6 S. W., (for example) will indicate that the upper strata of clouds travel with extreme velocity from S. W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of 2, cumuli, (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 the heat of rivers, &c. 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 elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

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

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

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

The Council recommend that term-day observations be taken;—viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B. Edinburgh, 10th November 1870.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

Obdwing. J. Buchanan, Secy. Feb. 1874 - MR ALEXANDER BUCHAN, Secretary of the Meteorological Society of Scotland, General Post Office Buildings, EDINBURGH.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Hammerfeld (Lubstone Row), County of Abertee, in Lat. 57° 8' 3", Long. 2° 7' 35", Distance from Sea 2 1/2 miles.Height of Cistern of the Barometer above Mean Sea-level 139 1/2 feet, above Ground 15 1/2 feet.During the MONTH of March, 1874.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				S.E.P. REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.		
		9 h. A.M.		9 h. P.M.		Max. in Shade, 4 feet above Ground.		Min. in Sun, rays.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.								
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	No. 7355.	No. 107546.	No. 7355.	No. 107546.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	9 A.M.	9 P.M.	9 A.M.	9 P.M.	No. 8 inches.	No. 12 inches.	No. 22 inches.						
		inches.		inches.																												
	1	29.774	49.6	30.050	48.6	43.9	40.2	37.1	43.2	42.8	43.0	42.9	SE	1	SE	1	ESE 2.5	12	0.215										Fog	1		
	2	30.302	49.1	30.420	49.6	43.8	41.0	41.2	42.7	42.7	42.9	41.8	SE	1	SW	1	SSW 1.5	6	0.075										Fog	2		
	3	30.396	48.2	30.330	52.5	47.0	40.2	40.7	42.7	42.1	45.0	44.3	S	1.5	SW	0.5	SSW 1.5	0	0.003										Fog	3		
	4	30.310	51.7	30.302	54.0	54.0	42.4	41.4	46.4	45.6	46.0	45.0	SW	1	SW	1.5	WSW 2	6	0.070												4	
	5	30.396	52.4	30.640	51.2	47.7	37.0	42.6	44.0	43.6	38.7	37.2	NE	1	NE	1.5	NE 1.5	1	0.010												5	
	6	30.696	49.0	30.544	53.0	54.9	30.8	28.4	35.4	34.3	44.0	39.0	W	1	W	1	W 1.5	0	0											Hear frost	6	
	7	30.388	53.0	30.048	53.3	55.7	33.4	25.1	44.9	39.4	41.3	37.5	SW	0.5	W	1.5	WSW 2	0	0											Hft.	7	
	8	29.626	53.2	29.446	51.6	53.0	34.8	35.9	46.9	44.7	35.8	33.3	SW	1.5	SW	1	WSW 3	4	0.053											Steel, Hair.	8	
	9	29.504	47.1	29.570	44.6	36.6	27.0	26.4	32.3	31.7	28.3	28.3	SW	1.5	SW	1.5	WSW 3	12	0.195											Snow 5 in. on average	9	
	10	29.656	45.0	29.690	42.0	34.0	24.3	24.8	31.3	31.1	27.0	27.0	SW	1	SW	2	WSW 3	13	0.170											Hail, snow about 7 in. more	10	
	11	29.872	42.3	29.986	42.3	37.3	24.6	22.4	30.0	30.0	25.2	25.0	SW	2	SW	1	WSW 4	9	0.190											Snow - mostly melting soon after it fell	11	
	12	29.824	43.3	30.024	46.3	46.0	24.6	22.2	40.2	38.6	33.7	32.8	W	0.5	SW	0.5	NE 1	1	0.010											Snow	12	
	13	30.080	47.1	30.246	50.5	48.8	32.1	25.0	43.7	40.7	37.5	37.0	SW	1	SW	0.5	WSW 1	4	0.025												13	
	14	30.040	49.0	30.000	50.7	50.3	34.3	30.4	44.9	42.8	47.4	47.2	SW	1	W	0.5	WSW 1.5	10	0.205											Fog	14	
	15	29.996	52.6	29.932	53.0	58.2	42.7	39.9	46.4	46.0	47.3	46.8	SW	0.5	SW	0.5	WSW 1	5	0.060												15	
	16	29.852	53.6	29.616	54.7	55.1	41.6	36.2	48.8	47.7	51.2	49.7	SW	1	SW	2	WSW 3.5	3	0.020												16	
	17	29.566	55.2	29.622	57.6	60.8	48.4	43.0	53.2	51.6	50.2	46.9	W	1.5	W	1.5	WSW 2.5	0	0											Steel	17	
	18	29.564	54.2	29.898	53.0	51.0	39.0	36.8	49.1	44.8	40.0	38.0	SW	2	SW	1	WSW 4	1	0.037											So. Ha. 1 Rtn.	18	
	19	29.508	49.6	29.310	48.8	49.6	35.6	32.0	39.0	38.7	36.8	35.2	SW	1.5	SW	1.5	WSW 5	5	0.150											Hail	19	
	20	29.600	46.0	29.878	47.3	46.3	34.1	31.7	41.6	37.4	39.0	38.0	SW	2.5	SW	1	WSW 3.5	3	0.120											Steel snow	20	
	21	29.674	47.6	29.446	51.1	50.7	34.1	30.0	41.4	41.4	44.4	44.9	SW	1.5	W	3.5	WSW 4	3	0.060											Snow	21	
	22	29.556	52.8	29.858	56.2	62.2	44.9	40.1	52.8	49.0	52.4	51.0	W	1	W	0.5	WSW 1.5	3	0.017												22	
	23	29.964	58.2	29.968	59.7	63.3	40.3	33.4	56.7	51.0	51.8	49.9	SW	0.5	SW	1.5	WSW 2	0	0												23	
	24	29.936	57.0	30.350	53.3	53.3	39.0	43.4	49.2	45.6	40.3	39.0	W	1.5	NE	0.5	WSW 3	1	0.010												24	
	25	30.382	54.7	30.250	54.5	49.9	31.3	26.4	46.8	43.3	40.0	38.5	SW	1	SW	1.5	WSW 2	0	0												25	
	26	30.080	54.3	29.922	53.3	53.3	36.1	29.3	48.6	44.0	47.0	44.0	SW	1	SW	2	WSW 3	3	0.045												Hft.	26
	27	29.640	52.0	29.292	52.7	50.1	41.5	38.4	46.7	45.8	48.7	46.9	SW	1	SW	1.5	SW 3.5	0	0												Lu. ha. evening	27
	28	29.592	54.8	29.332	52.9	53.0	39.6	33.4	47.0	43.4	41.7	38.8	SW	1.5	SW	2	SSW 3.5	0	0												Fog at times during day	28
	29	29.304	53.7	29.126	52.6	53.0	34.8	27.2	47.6	45.0	43.6	41.2	SW	1	SW	1	WSW 2	2	0.030												Fog at times during day	29
	30	29.094	53.3	29.498	54.3	52.4	38.2	35.2	46.9	43.3	41.2	40.0	SW	3	SW	0.5	WSW 4	4	0.030												30	
	31	29.260	53.9	29.362	54.0	55.0	38.0	31.3	50.3	48.2	39.0	37.0	SW	1	SW	2	WSW 3.5	2	0.033												Fog early Am.	31
	Sums.	925.436	1583.5	925.766	1603.2	1572.4	1125.9	1031.3	1380.7	1316.3	1295.2	1248.1		385	385			113	1857				206	175							NOTATION USED IN GENERAL REMARKS.	
	Means.	29.852	51.08	29.8455	51.7	50.72	36.38	33.2	44.58	42.47	42.82	40.27		1.24	1.24			6.6	6.6													
	† Total Corrections for Instrumental Errors.	-0.013		-0.013		+0.2	+0.3	-0.2	0	0	0	0		0.6	0.6																	
	† Corrections for Diurnal Range.																															
	“Corrected Means.”	29.840	51.1	29.857	51.7	50.9	36.6	33.1	44.5	42.5	41.8	40.3		1.24	1.24			3.70060					6.6	6.6								
	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), = 29.780
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 29.795
Mean at Station, corrected, and at 32°, = 29.787 29.829
Correction for height, 139 1/2 feet above Mean Sea-level, = +0.155 +0.113
Mean, reduced to 32°, and Sea-level, = 29.942 29.942
Highest Reading, corrected for Index error, on the 6th, = 30.683 30.725
Lowest Do. Do. on the 30th, = 29.081 29.122
Difference, or Monthly Range, = 1.602 1.603

Each instrument tested at the Office in Edinburgh bears the stamp “S.M.S.” and a number to be entered in the Headings or the Number and Initials of the Make may be given.
†† The Annual Range for Scotland is as yet unknown.
†† These “Hygrometrical Corrections” are calculated from Glaisher’s Hygrometrical Tables, Second Edition only.
While the Diurnal Range is unknown, the Arithmetic Mean of Cols. 6 and 7 will be entered as the “Calculated Mean Temperature.”
Any Observations not taken under the conditions specified in the Directions on the other side or noted at the top of each column, must be marked as such by the observer, in each Schedule. See over.

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

Observations made and Return verified by Mr. Beverly assisted by Serg. M. M. Macdonald
Janitor, Grammar School, Aberdeen

* On 19th intermediate observations were
1.30 P.M. Bar (uncorrected) 28.980 at 4.15 P.M. 10 SW. 3 max 5.6
4.45 Wind veered
2.30 P.M. Bar 28.958 — 48 C.S. 3 H.W. 4
Bar. rose from this time.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 23rd, = 63.5
Lowest in Month, corrected for Index errors, on the 10th, = 24.6
Difference, or Monthly Range, = 38.9
“Corrected Mean” of all the Highest, (Col. 5), = 50.9
“Corrected Mean” of all the Lowest, (Col. 6), = 36.6
Difference, or Mean Daily Range, = 14.3
“Calculated Mean Temperature” of Month, = 43.8

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 11th, = 22.0
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 33.1
Lowest at Night, Black Bulb, (corrected for Index errors), on the 12th, = 22.0
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 33.1
Difference of above Means or Range (“exposed”), = 11.1

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 43.2
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 41.4
“Computed Temperature of Dew-Point,” = 39.3
“Do. Elastic Force of Vapour,” = 0.240 in.
“Do. Weight of Vapour in a Cubic Foot of Air,” = 2.76 lbs
“Relative Humidity, (Saturation = 100),” = 85.8%
RAIN fell on 24 Days; Amount in Inches, = 1.857

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		0	1	0	2	1	14	5	6	2	1.24
P.M.		0	2	0	1	0	10	6	11	1	1.24
Mean.		0	2	0	1	0	12	6	8	2	1.24 = 1.54 lbs

Evaporation 2.669 in. See letter 3rd April 1874

Greatest daily range 24.1 on the 6th
(Signed) Stet. Beverly

Col. 8
On 10th verified in melting snow
ther. 54.8 10th and after leaving
it along train in steam melting snow
found correction to be
+ 0.3

On 9th and 10th March, snow blown out of place
from the ancient depth of snow on the two days
(see above) I estimate that the amount of Rain on
these two days should be increased thus:—
on 9th + 0.222
on 10th + 0.413
Total for March = 0.635
The total for March = 2.492, i.e. if this estimate be accepted

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

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

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

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

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

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

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

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

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, *Self-Registering Thermometers*.—Professor Phillips, and Negretti and Zambra Patent "Marinum" Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "Marinum" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Marinum." This Thermometer is liable to two demerits, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument, repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be disengaged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "Marinum" 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 exposed by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs—the mouth 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 mouth is always *clean* and *whole*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water-cup underneath. This arrangement must be immediately altered by putting 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—89°.9, 40°-0, or 40°-1; or, again, 40°-4, 40°-5, or 40°-6, according as it indicates a little under, an exact coincidence with, or a little over 40°. or 40½, respectively. So, also, 40½, 40°-7, or 40°-8 respectively. In reading Kew's "Juno," and "Juno" Thermometers, the reading Kew's "Juno," and "Juno" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

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

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

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

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

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

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich, and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, 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-margins. 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 agriculturists. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

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

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

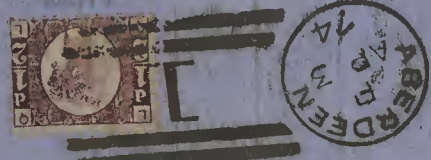
EDINBURGH, 10th November 1893.

(By Order) A. B.

BOOK-POST.

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

MR ALEXANDER BUCHAN,



OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Hammerfield, Culterstone Road, County of Aberdeen, in Lat. 57° 3' N, Long. 2° 7' 35" W, Distance from Sea 2 1/2 miles.
Height of Cistern of the Barometer above Mean Sea-level 139 1/2 feet, above Ground 15 1/2 feet. During the MONTH of April 1874.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	13. BAROMETER, by <i>Adie</i>				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER, No. 2237				WIND.				RAIN.				CLOUDS.				THERMOMETERS under Ground.				SEA.	OZONE.	GENERAL REMARKS.				Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulb, 4 ft. in Sun's rays.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Direction.	Force.	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.	sleet.
fr.	frost.	sq.	snow.
h. fr.	hoar-frost.	s. h.	solar halo.
h. d.	heavy dew.	sq.	squall.
h. l.	hail.	sq.	squalls.
l.	lightning.	t. s.	thunder.
li. cl.	light clouds.	w.	wind.
li. sh.	light showers.	w. 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†† = 29.554 at level
for Temp. (Col. 2), = 2.9.6.2.1. - 0.067
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.583 at level
for Temp. (Col. 4), = 2.9.6.2.2. - 0.070
Mean at Station, corrected, and at 32°, = 29.569 29.610
Correction for height, ^{139 1/2} feet above Mean Sea-level, = +0.154 + 0.113
Mean, reduced to 32°, and Sea-level, = 29.723

WITH REMARKS ON THE USE OF INSTRUMENTS.

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.

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.

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

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside,

Self Registering Thermometers.—Professor Phillip's, and Negretti and Zambra's Patent "*Maximum*" Thermometers are recommended: printed directions for their use may be ob-

1

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,

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully *tested* by comparison with a *Standard Thermometer*. When such

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this ap-

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

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 *columna* of mercury. The

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

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

The Council would recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that

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

Snow-falls may, *for convenience*, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should be noted in the “Remarks,” and the letter S

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

100

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

2, W. upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the

column, an entry of —, (e.g.) will indicate that the higher 2, cu-st, regions are covered to the "amount" of 4-tenths with *stratus*.

Underground Thermometers.—As the germination and health of crops and plants greatly depend on the temperature of the

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

Ozone.—Mention whether Schonbein's or Mofiat's papers are used. The paper is affixed by a pin to a board in the thermometer box; and the indications registered at 9 A.M. and 9 P.M.

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

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

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

The Council recommend observers, before purchasing new instruments, to communicate with the Meteorological Secretary ; and they consider it desirable that he should have full power

(By Order) A. B.
EDINBURGH, November 1878.

10

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	Alder,	Beech,	Birch,	Blm,	Larch,	Yew,	Sycamore or Plane,
In Flower.							
In First buds							
In First appear.							
In Leaf.							
Divided of Leaves.							
CROPS.	Barley,	Oats,	Wheat,	Beans,	Potatoes,	Turnips,	Rye Grass,
Growing in variety.		Bare or High.					
Sowing or Planting.							
Growing or above ground.							
In Ear.							
In Flower or raised.							

[illegible]

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

BOOK POST.

EDINBURGH.

Secretary of the Meteorological Society of Scotland.

Mr ALEXANDER BUCHAN.

Verde
April 1874.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Hammerfield, Cuparstone Road, County of Aberdeen, in Lat. 57° 8' 3" N, Long. 2° 7' 35" W, Distance from Sea 2 1/2 miles.
 Height of Cistern of the Barometer above Mean Sea-level 139 1/2 feet, above Ground 15 1/2 feet. During the MONTH of May 1874.
 The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	B.S. BAROMETER.		SELF-REGISTERING THERMOMETERS.		HYGROMETER.		WIND.				RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.									
		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.													
		Barometer.	Attach- ed Ther- mometer	Barometer.	Attach- ed Ther- mometer	Max. in Shade, 4 feet above Ground.	Min. on Grass.	Max. in Shade, 4 feet above Ground.	Min. on Grass.	Barometer.	Attach- ed Ther- mometer	Barometer.	Attach- ed Ther- mometer	Barometer.	Attach- ed Ther- mometer	Barometer.	Attach- ed Ther- mometer	Barometer.					Attach- ed Ther- mometer								
		No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236					No. 236								
		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.									
		30.050	56.3	30.150	57.1	52.1	41.0	40.6	49.9	45.0	42.0	40.1	NE 1	NE 1	NE 1.5	0	0														
		30.156	55.1	30.028	54.7	51.8	33.2	27.4	49.2	43.8	42.0	40.0	NE 1	NE 1	NE 1.5	2	0.015														
		29.816	55.0	29.828	51.4	47.3	38.2	32.0	45.7	44.0	40.3	39.5	NE 1	NE 1	NE 1.5	3	0.020														
		29.844	51.0	29.906	50.4	47.8	37.4	34.6	43.6	41.0	41.8	40.9	NE 1	N 1	NE 2	4	0.063														
		29.900	50.6	29.812	51.8	51.8	38.4	36.3	44.0	42.4	38.9	38.1	N 1	N 1	NE 1.5	5	0.047														
		29.694	50.5	29.604	53.0	53.8	35.5	28.8	45.7	42.9	41.1	40.1	NW 1	NW 1	NE 1.5	3	0.040														
		29.608	52.2	29.642	50.8	47.6	36.4	29.5	46.9	43.8	40.6	39.9	N 1	NE 0.5	NE 1.5	5	0.200														
		29.628	49.3	29.626	52.0	50.0	35.3	30.8	44.8	41.7	39.5	38.3	NE 1.5	NE 1	NE 2	3	0.057														
		29.628	50.0	29.706	49.3	46.3	34.4	30.1	40.3	38.8	40.1	38.4	N 1	N 1	NE 0.5	3	0.025														
		29.816	50.5	29.920	51.2	49.6	35.4	29.7	44.9	42.5	39.9	38.0	N 1	NE 0.5	NE 1.5	2	0.070														
		30.012	50.8	30.122	51.7	48.9	36.2	30.1	47.8	43.8	41.8	40.0	NE 1	NE 0.5	NE 1.5	3	0.020														
		30.216	50.0	30.296	52.0	46.3	38.7	37.4	42.6	40.3	41.4	39.5	NE 1	NE 1	NE 2.5	0	0														
		30.324	52.3	30.296	52.8	48.8	38.7	36.8	44.7	41.6	42.0	40.3	E 1	Var	0.5	0	0														
		30.242	53.3	30.088	52.7	51.9	37.8	29.7	48.9	44.8	38.9	38.5	Var	0.5	NE 0.5	NE 1	8	0.310													
		30.216	51.7	30.310	54.0	49.0	36.1	33.9	44.7	42.4	42.3	40.4	NE 1.5	NE 0.5	NE 2	1	0.007														
		30.308	53.3	30.282	54.6	52.0	31.4	28.6	45.5	42.4	40.9	39.8	NE 0.5	SW 0.5	SSW 1	0	0														
		30.240	55.3	30.210	55.9	61.4	34.0	28.1	54.9	50.4	47.6	43.7	SE 0.5	S 0.5	SW 1	0	0														
		30.222	57.4	30.272	57.9	56.3	41.4	33.0	51.7	49.8	49.0	47.6	NE 1	SE 0.5	NE 1	0	0														
		30.294	57.4	30.292	55.6	55.8	45.0	42.4	49.8	47.5	46.1	44.6	NE 1	E 1	ENE 1.5	0	0														
		30.270	58.0	30.188	59.7	51.0	43.9	43.0	47.4	45.8	47.0	46.0	Var	0.5	S 0.5	SW 1	0	0													
		30.094	56.4	29.968	55.9	50.3	42.6	42.2	44.8	43.8	46.0	44.0	SE 0.5	S 0.5	SSE 1	0	0														
		29.844	54.9	29.744	55.0	49.0	43.6	42.3	46.4	44.1	45.7	45.0	SE 1	SE 0.5	ESE 1.5	0	0														
		29.676	57.7	29.698	56.7	55.2	44.6	43.6	50.2	49.4	47.3	46.4	NE 1	SE 1	ESE 1.5	1	0.010														
		29.706	57.6	29.780	55.7	49.3	43.4	39.9	47.7	46.4	47.8	46.6	E 1	SE 1	ESE 2	5	0.325														
		29.886	56.9	29.964	56.0	51.0	46.0	44.9	49.7	48.2	47.0	46.5	SE 1	S 1	SSE 2	0	0.005														
		29.954	55.7	29.870	55.4	55.1	45.4	45.2	51.1	49.6	50.0	49.6	SW 1	Var	0.5	SSW 2	0	0													
		29.894	59.1	29.704	58.7	57.0	46.8	41.9	56.1	52.4	51.5	51.0	SE 0.5	SW 0.5	SW 1	4	0.135														
		29.580	59.7	29.740	61.0	63.0	47.4	47.2	58.9	53.3	52.3	47.0	NW 1.5	NW 1	NW 3	1	0.007														
		29.754	60.5	29.680	59.7	61.0	41.6	36.4	57.3	51.6	50.3	50.0	W 0.5	SW 2	SSW 2.5	5	0.200														
		29.396	62.4	29.520	62.4	66.1	47.3	46.9	60.1	57.8	56.0	52.6	SW 1.5	SW 0.5	WSW 2.5	0	0														
		29.582	62.7	29.512	60.9	61.3	49.7	47.0	58.0	56.3	56.7	53.6	SW 2	SW 1.5	WSW 3	0	0														
Sums.		927.850	1703.8	927.758	1705.7	1639.5	1246.8	1140.3	1513.3	1427.6	1398.0	1348.0	30.5	23.5	58.2	1.556															
Means.		29.926	54.96	29.927	55.04	52.88	40.22	36.78	48.86	46.66	44.96	43.48	0.98	0.76	1.9	0.050															
† Total Corrections for Instrumental Errors.		-0.013	-	-0.013	-	+0.2	+0.3	-0.2	0	0	0	0	0-6	0-6																	
† Corrections for Thermal Range.		29.918	55.0	29.915	55.0	53.1	40.5	36.6	48.8	46.1	45.0	43.5	0.98	0.76	1.9	0.050															
"Corrected Means."		29.918	55.0	29.915	55.0	53.1	40.5	36.6	48.8	46.1	45.0	43.5	0.98	0.76	1.9	0.050															
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), = 29.847 *at level of*
 for Temp. (Col. 2), = 29.847 *at level of*
 "Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 29.844 *at level of*
 for Temp. (Col. 4), = 29.844 *at level of*
 Mean at Station, corrected, and at 32°, = 29.845 *29.886*
 Correction for height, 139 1/2 feet above Mean Sea-level, = 40.154 *+0.113*
 Mean, reduced to 32°, and Sea-level, = 29.999 *29.999*
 Highest Reading, corrected for Index error, on the 13 th, = 30.311 *30.353*
 Lowest Do. Do., on the 30 th, = 29.383 *29.423*
 Difference, or Monthly Range, = 0.928 *0.930*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 30 th, = 66.3
 Lowest in Month, corrected for Index errors, on the 16 th, = 31.7
 Difference, or Monthly Range, = 34.6
 "Corrected Mean" of all the Highest, (Col. 5), = 53.1
 "Corrected Mean" of all the Lowest, (Col. 6), = 40.5
 Difference, or Mean Daily Range, = 12.6
 ** Calculated Mean Temperature of Month, = 46.8
 S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the th, = 66.3
 "Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 66.3
 Lowest at Night, Black Bulb, (corrected for Index errors), on the 2 th, = 27.2
 "Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 36.6
 Difference of above Means or Range ("exposed"), = 39.7

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 46.9
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 44.8
 †† Computed Temperature of Dew-Point, = 42.5
 †† Do. Elastic Force of Vapour, = 0.272 *In*
 †† Do. Weight of Vapour in a Cubic Foot of Air, = 3.08 *lbs.*
 †† Relative Humidity, (Saturation = 100), = 85.2
 RAIN fell on 18 Days; Amount in Inches, = 1.568

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		4	12	2	5	0	3	1	2	2	0.98
P.M.		3	10	1	4	4	5	0	2	2	0.76
Mean.		3	11	2	4	2	4	1	2	2	0.87

Evaporation = 3.716 *in.*
 Greatest daily range 27.3 on the 14 th.
 (Signed) Ally. Beverley
 N.B. Cols. 9, 10, 11, 12.
 whenever the reading is above 52° 0, a correction (viz. -0.1) ought to have been applied. It has not been applied here.

Observations made and Return verified by Ally. Beverley, assisted by Sergeant Murrell
Janitor Grammar School, Aberdeen.

* Actual readings at Grammar School, same days unknown;
 Highest 30.367
 Lowest 29.419
 Range 0.948

WITH REMARKS ON THE USE OF INSTRUMENTS.

Protection of Thermometers.—The Council of the Society recommends that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from any local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation in 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 may also be made to open to the south.

Self Registering Thermometers.—Professor Puilli's, and Negretti and Zambri's Patent "*Maximum*" Thermometers are recommended; priced directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rutherford is recommended and should be affixed to a frame separate from the "*Maximum*." It is recommended that these Thermometers be graduated on the glass stem. The "*Minimum*" Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will found in the upper lobes; must be

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

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

EDINBURGH, November 1873.

BOOK POST.

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

[illegible]

Whether Epizootic from blight, disease, etc. Whether prevalent among cattle; and the Agricultural condition of the district generally.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Hammerfield, Buchanan Road*, County of *Abertee*, in Lat. $57^{\circ}8'34''$, Long. $2^{\circ}7'35''$, Distance from Sea $2\frac{1}{2}$ miles.
Height of Cistern of the Barometer above Mean Sea-level $139\frac{1}{2}$ feet, above Ground $15\frac{1}{2}$ feet.
During the MONTH of *June* 187*4*.
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	B.S. BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.	OZONE.	GENERAL REMARKS.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs. 9444.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H. Cup Anemometer. No. 1111.		No. of hours in which it fell.	Amount in inches. No. 2633.	Velocity (1-6) and Direction.	Amount (0-10) and Direction.	P.M. Amount (0-10) and Direction.	SUNSHINE.					THERMOMETERS under Ground.			Temperature of Water at Surface of Weather No.	Temperature of Air at Surface and Dew Point.	0-10.	As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
		Barometer. No. 2236.	Attached Thermometer.	Barometer. No. 2236.	Attached Thermometer.	Max. No. 2232.	Min. No. 1075.	Max. in Sunshade No. 2235.	Min. on Grass. No. 2235.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force. P.M.	Direction.	Force. P.M.	No. of hours.	No. 3 inches.						No. 12 inches.	No. 22 inches.	No. 3 inches.			No. 12 inches.	No. 22 inches.						9 A.M.	9 P.M.	Mention the hour at which Storms, including Thunder and Lightning, began and ended.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† for Temp. (Col. 2), = 29.979
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 30.002
Mean at Station, corrected, and at 32° = 29.901 29.942
Correction for height, $139\frac{1}{2}$ feet above Mean Sea-level, = $+0.151$ $+0.110$
Mean, reduced to 32°, and Sea-level, = 30.052 30.052
Highest Reading, corrected for Index error, on the 15 th, = 30.585 30.626
Lowest Do. Do., on the 30 th, = 29.537 29.577
Difference, or Monthly Range, = 1.048 1.049

S.R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 4 th, = 74.0
Lowest in Month, corrected for Index errors, on the 13 th, = 39.5
Difference, or Monthly Range, = 34.5
"Corrected Mean" of all the Highest, (Col. 5), = 64.7
"Corrected Mean" of all the Lowest, (Col. 6), = 46.4
Difference, or Mean Daily Range, = 18.3
** Calculated Mean Temperature of Month, = 55.6
S.R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 4 th, = 74.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 74.0
Lowest at Night, Black Bulb, (corrected for Index errors), on the 13 th, = 30.9
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 41.1
Difference of above Means or Range ("exposed"), = 33.1

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 55.7
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 52.7
†† Computed Temperature of Dew-Point, = 49.9
†† Do. Elastic Force of Vapour, = 0.361 in.
†† Do. Weight of Vapour in a Cubic Foot of Air, = 4.04 grs.
†† Relative Humidity, (Saturation = 100), = 81.7
RAIN fell on 7 Days; Amount in Inches, = 0.946
at Rose St. = 0.230
WIND. SUMMARY.
Direction. N NE E SE S SW W NW Calm or Variable. Mean Force. Mean Velocity in miles per day.
A.M. 4 3 1 4 1 9 4 3 1 1.28
P.M. 3 3 0 6 2 10 2 3 1 0.87
Mean. 3 3 1 5 2 9 3 3 1 1.075 = 1.166

Evaporation = 6.006 Inches

Observations made and Return verified by *Alex. Beverley assisted by Sergeant Spruill*
Jarvis of Grammar School

(Signed) *Alex. Beverley*

x Actual at Grammar School same days shown:-

Highest 30.631
Lowest 29.573
Range 1.058

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

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

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

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

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

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

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The lids 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 may also be made to open to the south.

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

dislodged from thence by heating by contact with a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally, 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; or the sun's heat to affect the Minimum Thermometer by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are *not graduated* on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being *re-tested*. The self-registering, and especially the "*Minimum*," Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached; the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb, in no case under the bulbs; the 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.

Reading of the Thermometers.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39.3, 40.0, or 40.1; or again, 40.3, 40.3, or 40.6, according as it indicates a little under, an exact coincidence with, or, a little over 40°, or 40½°, respectively. So also 40.1, and 40½, more or less must be registered 40.2 or 40.3 and 40.4 or 40.8 respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

Wind.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction should be taken; and when it is stationary, and always when the wind is feeble, reference may be made 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 recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Wind's Anemometer may also be recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily at 9 A.M., and the readings entered in the returns of the day previous.

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

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

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the 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—, (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 depths of 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 should be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus from boats, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 15th, 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 Schönbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3 A.M., as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; i. e., that it is *blowing fresh*.

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

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

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should 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 so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

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

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

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

(By Order) A. B.

Edinburgh, November 1873.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	Flower.	Last buds.	In leaf.	Direct of leaves.	OPDS mentioning variety.	Soiling or above ground.	First Cut.	In Bar.	First Cut.
Alder.
Asp.
Beech.
Birch.
Blm.
Larch.
Time.
Oak.
Sycamore or Plane.

SHRUBS, ETC.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.
Barberry.
Bourtree or Elder.
Broom.
Hazel.
Hawthorn.
Holly.
Laburnum.
Lilac.
Mezereum.
Mountain Ash or Rowan.
Red Flowering Currant.
Rhododendron Ponticum.
Whin.

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

BOOK POST.

Mr. ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

Abdeen
June 1874

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Hammerfield, Cupar Road* County of *Aberdeen*, in Lat. *57° 8' 43" N*, Long. *2° 7' 35" W*, Distance from Sea *2 1/4* miles.
Height of Cistern of the Barometer above Mean Sea-level *139 1/4* feet, above Ground *15 1/4* feet. During the MONTH of *July* 187*4*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	B. J. BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. 2337				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.		OZONE.		GENERAL REMARKS.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		9 h. A.M.		9 h. P.M.		Protected in Shade 4 ft. above Ground.		Exposed Black Bulb, 4 ft. above Ground.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
		Barometer. No. 226	Atmospheric Thermometer	Barometer. No. 236	Atmospheric Thermometer	Max. No. 353	Min. No. 27	Max. in Sun rays No. 289	Min. on shade No. 289	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.	Velocity (0-10). and Direction.	Amount (0-10). and Species.	No. 1 inches.	No. 2 inches.	No. 3 inches.	Temperature of Wind, F. No.	Temperature of Air, F. and Dew Point, F.	9 A.M.	9 P.M.	As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.721
for Temp. (Col. 2), = 2.9.8.1.9. - 0.098 }
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.719
for Temp. (Col. 4), = 2.9.8.1.9. - 0.098 }
Mean at Station, corrected, and at 32° = 29.720 29.760
Correction for height, 139 1/4 feet above Mean Sea-level, = +0.150 +0.110
Mean, reduced to 32°, and Sea-level, = 29.870 29.870
Highest Reading, corrected for Index error, on the 16 th, = 30.195 30.236
Lowest Do. Do., on the 26 th, = 29.477 29.517
Difference, or Monthly Range, = 0.718 0.718

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
†† The Diurnal Range for Scotland is as yet unknown.
‡ Practically, though not absolutely a mean correction.
‡‡ These "Thermometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition only.
‡‡‡ While the Diurnal Range is unknown, the Arithmetic Mean of Cols. 6 and 7 will be entered as the "Calculated Mean Temperature."
Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 18 th, = 77.2
Lowest in Month, corrected for Index errors, on the 7 th, = 44.5
Difference, or Monthly Range, = 32.7
"Corrected Mean" of all the Highest, (Col. 5), = 67.3
"Corrected Mean" of all the Lowest, (Col. 6), = 52.1
Difference, or Mean Daily Range, = 15.2
** Calculated Mean Temperature of Month, = 59.7
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 7 th, = 36.5
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 47.6
Difference of above Means or Range ("exposed"), =

Evaporation = 4.469 in.

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 59.8
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 57.6
†† Computed Temperature of Dew-Point, = 55.7
† Do. Elastic Force of Vapour, = 0.444 in.
† Do. Weight of Vapour in a Cubic Foot of Air, = 4.92 grs.
† Relative Humidity, (Saturation = 100), = 87.8
RAIN fell on 19 Days; Amount in Inches, = 2.669

WIND.											
SUMMARY.											
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	4	0	3	6	10	1	5	1	0.98	
P.M.	1	2	0	4	3	14	2	4	1	0.79	0.79
Mean.	1	3	0	3	5	12	1	5	1	0.89	0.89

(Signed) Alex. Beverley

Greatest daily range 25.0 on the 4th

Observations made and

Return verified by

Alex. Beverley assisted by Serjt. Skene
Janitor, Grammar School

* Actual readings at
Grammar School, same days shown

Highest 30.227

Lowest 29.525

Range 0.702

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Hammerfield, Buchanan Road, County of Aberdeen, in Lat. 57° 3' N, Long. 2° 7' 35" W, Distance from Sea 2 1/4 miles.
 Height of Cistern of the Barometer above Mean Sea-level 139 1/2 feet, above Ground 15 1/2 feet. During the MONTH of August 1874.
 The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Thermometers Read Daily, at 9 P.M.				HYGROMETER. No. 2227				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.	OZONE.	GENERAL REMARKS.		Days of Month.								
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.																		
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (mi.-hr.)	Amount (inches).	Direction.	Amount (inches).	Direction.	Amount (inches).	No. 1.	No. 2.	No. 3.	Temperature and Density.						Temperature and Density.							
		No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236	No. 236						No. 236	No. 236	No. 236					
		inches.	°	inches.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°										
	1	29.608	63.0	29.640	63.0	68.2	44.1	35.1	58.8	54.0	56.8	53.7	NW	1	SW	0.5	NW	2	1	0.023										Sc. li. mist	1									
	2	29.256	67.0	29.262	65.6	70.2	52.8	51.0	68.9	62.6	58.0	56.1	SW	2	W	0.5	SW	3.5	1	0.010												2								
	3	29.658	63.0	29.744	63.8	67.4	48.3	45.2	56.9	52.0	53.6	52.1	NW	1	NW	0.5	NW	2.5	1	0.083												3								
	4	29.706	62.3	29.700	62.4	62.4	43.7	37.3	56.0	52.9	51.6	50.0	NW	0.5	SE	0.5	SE	1	4	0.340												4								
	5	29.446	63.0	29.196	60.7	58.0	43.7	38.2	54.9	52.0	51.6	48.1	SW	1.5	NW	1	SW	2	6	0.395												Sc. li. mist	5							
	6	29.516	59.7	29.704	60.0	59.5	47.9	44.4	53.8	49.7	49.3	47.5	NW	1.5	NW	0.5	NW	4	1	0.010													6							
	7	29.314	58.7	29.338	63.3	71.3	47.4	39.9	52.8	52.8	56.0	54.5	SE	1	W	0.5	SE	3.5	1	0.010													7							
	8	29.338	64.7	29.408	63.1	64.8	44.7	37.8	63.8	58.8	53.1	52.0	SW	1	NW	0.5	SW	1.5	7	0.513													Sh. li. hail 1-2 P.M.	8						
	9	29.468	63.3	29.480	63.3	59.9	48.1	44.6	54.0	53.0	53.0	53.0	SW	0.5	SE	0.5	SW	1	3	0.450													Sc. li. mist	9						
	10	29.368	62.7	29.318	62.0	59.0	47.4	43.1	55.6	54.5	55.5	55.5	SE	0.5	SE	0.5	SE	1	20	1.775													Fog rain	10						
	11	29.250	61.9	29.248	62.3	60.3	53.0	53.1	56.3	56.0	57.7	57.3	NE	0.5	NE	1	NE	2.5	6	0.383													Fog	11						
	12	29.324	62.2	29.390	63.7	66.0	51.7	49.8	59.0	56.4	55.0	57.7	SW	1	SW	0.5	SW	1	4	0.110													Sh. 2-4 P.M.	12						
	13	29.414	63.7	29.390	62.0	57.9	52.0	48.7	56.6	55.7	54.9	54.3	NE	1	SE	1	SE	1.5	10	1.435													Much lightning 10 P.M.	13						
	14	29.204	62.0	29.384	61.7	60.3	52.1	51.3	56.7	55.9	55.0	57.7	NE	1	N	1.5	NE	3	3	0.190													Heavy Sh & Li with Rain 1-6 A.M.	14						
	15	29.570	61.6	29.634	63.0	63.7	51.1	48.2	55.6	53.0	54.0	52.8	W	1	SW	0.5	SW	2.5	1	0.010														15						
	16	29.724	63.4	29.658	61.4	64.2	41.7	34.4	58.2	54.0	52.0	50.0	SW	1.5	W	1	SW	2.5	0	0														16						
	17	29.804	62.8	29.996	63.3	68.2	46.0	40.9	62.0	55.0	55.2	52.9	NW	1.5	NW	0.5	NW	2	2	0.027														17						
	18	29.944	61.7	30.044	66.0	70.0	45.6	39.5	54.1	52.0	62.5	61.3	S	1	W	0.5	SW	1.5	1	0.013													Fog. meteors 11 P.M.	18						
	19	30.152	66.4	30.242	69.0	74.7	53.0	47.6	65.0	61.4	64.8	62.5	SW	1	SW	1	SW	2	5	0.043															19					
	20	30.398	66.8	30.488	65.6	64.9	53.0	52.4	56.0	54.7	54.3	53.0	NE	1	SE	0.5	NE	1	0	0														Fog	20					
	21	30.470	65.7	30.418	65.5	65.8	46.1	39.0	61.8	58.0	54.3	53.0	S	1	SW	1	SW	1.5	0	0															21					
	22	30.348	66.4	30.334	67.0	69.0	45.1	39.9	64.0	60.5	56.7	55.9	SE	0.5	SW	1	SW	1.5	0	0														Fog	22					
	23	30.350	67.6	30.328	63.7	65.2	48.7	43.4	59.0	54.4	50.0	48.2	N	1.5	N	1	NW	1.5	0	0															23					
	24	30.240	62.0	30.126	61.9	59.2	38.3	32.6	56.4	52.1	52.4	50.2	SE	0.5	SE	0.5	SE	1	0	0															24					
	25	30.074	61.7	30.020	62.2	59.0	49.5	44.6	56.6	52.7	52.3	53.0	SE	0.5	SW	0.5	SW	1	1	0.010															25					
	26	29.932	62.6	29.766	63.2	62.7	52.1	48.0	57.4	55.9	55.7	53.3	N	0.5	SW	0.5	SW	1	0	0															26					
	27	29.590	63.4	29.512	63.2	61.0	53.4	49.6	59.8	58.0	54.7	54.6	SW	1	SW	0.5	SW	1.5	8	0.910														Thunder evening. Rain in night	27					
	28	29.628	64.1	29.626	62.7	65.1	47.8	43.4	58.0	53.4	52.6	52.0	SW	1	SW	0.5	SW	1	1	0.015															28					
	29	29.512	62.7	29.506	62.9	59.7	47.7	41.1	56.6	53.5	48.9	48.3	SW	1	SW	0.5	SW	1.5	3	0.100															29					
	30	29.606	63.9	29.508	60.9	63.0	39.8	35.0	58.8	54.1	55.0	53.9	SW	0.5	W	1.5	SW	2	4	0.095															30					
	31	29.360	64.9	29.546	64.3	65.3	51.2	49.3	59.7	54.8	53.0	51.7	SW	1.5	SW	1	SW	2	4	0.065															31					
																															NOTATION USED IN GENERAL REMARKS.									
																															a. denotes aurora. m. denotes meteor.									
																															ci. cirrus. n. nimbus.									
																															ci.-cu. cirro-cumulus. r. rain.									
																															ci.-s. cirro-stratus. h. r. heavy rain.									
																															cu. cumulus. c. h. r. continued heavy rain.									
																															cu.-s. cumulo-stratus. s. stratus.									
																															d. dew. sc. scud.									
																															f. fog. s. sleet.									
																															fr. frost. s. snow.									
																															h.-fr. hoar-frost. sc. ha. solar halo.									
																															h. haze. sq. squall.									
																															h. d. heavy dew. ag. ags. squalls.									
																															hl. hail. t. thunder.									
																															l. lightning. t. s. 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 0.5 1' Calm Very light air Light air 1' 2' 3' Light breeze Fresh breeze Very fresh 4 5 6 Blowing hard Blowing a gale Violent gale									
																															"Corrected Means." 29.683 63.4 29.695 63.3 64.3 48.3 43.3 58.1 54.9 54.4 53.1 1.0 0.7 3.6 0.217 6.4 6.45									
																															No. of Column. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30									

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results between 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 who kindly furnish Reports to the Society will by their Monthly Returns, furnish the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

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

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

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

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

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

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

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as 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 may also be made to open to the south.

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 and should be affixed to a frame separate from the "*Maximum*." It is recommended that these Thermometers be graduated on the glass stem. The "*Minimum*" Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper bob, and must be

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully *tested* by comparison with a *Standard Thermometer*. When such Thermometers as are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the scale, and ought never afterwards to be used without being *re-tested*. The self-registering, and especially the "*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.

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 red bulb—in no case under the bulb;—the bulb must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with 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.

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°·9, 40°·0, or 40°·1; or again, 40°·4, 40°·5, or 40°·6, according as it indicates a little under, an exact coincidence with, or, a little over, 40°, or 40°, respectively. So also 40°·1, and 40°·2, more or less must be registered 40°·2 or 40°·3 and 40°·4 or 40°·5 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 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 days. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

Wind.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction should be taken; and when it is stationary, and always when the wind is feeble, reference may be made 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 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 may also be recommended; the method of *Estimating Wind Force* by such tables as that given in the schedule is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observations, 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 at 9 A.M., and the readings entered in the returns of the day previous.

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

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

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," $\frac{2}{3}$ (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{2}{3}$, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

Sunshine.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column. *Underground Thermometers.*—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to depths of 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 should be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

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

Ozone.—Mention whether Schönbien's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $\frac{5}{8}$, as an *ozone* entry in the schedule, will indicate that the ozone paper is united as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; i. e., that it is *blowing fresh*.

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

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

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should 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 so that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

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

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

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

(By Order) A. B.

Edinburgh, November 1874.

BOOK POST.

EDINBURGH.

Secretary of the Meteorological Society of Scotland,

Mr. ALEXANDER BUCHAN,

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OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	IN	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	Fourteenth	Fifteenth	Sixteenth	Seventeenth	Eighteenth	Nineteenth	Twentieth	Twenty-first	Twenty-second	Twenty-third	Twenty-fourth	Twenty-fifth	Twenty-sixth	Twenty-seventh	Twenty-eighth	Twenty-ninth	Thirtieth
Alder.																															
Ash.																															
Beech.																															
Birch.																															
Elm.																															
Larch.																															
Lime.																															
Oak.																															
Sycamore or Plane.																															

SHRUBS, ETC.	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	Fourteenth	Fifteenth	Sixteenth	Seventeenth	Eighteenth	Nineteenth	Twentieth	Twenty-first	Twenty-second	Twenty-third	Twenty-fourth	Twenty-fifth	Twenty-sixth	Twenty-seventh	Twenty-eighth	Twenty-ninth	Thirtieth
Barberry.																														
Boureaux or Elder.																														
Broom.																														
Hazel.																														
Hawthorn.																														
Holly.																														
Laburnum.																														
Lilac.																														
Mezerion.																														
Mountain Ash or Rowan.																														
Red Flowering Currant.																														
Rhododendron Ponticum.																														
Whin.																														

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Hammerfield, Cupar Road* County of *Abertee* in Lat. $57^{\circ}8'3''N$, Long. $2^{\circ}1'35''W$, Distance from Sea $2\frac{1}{2}$ miles.
Height of Cistern of the Barometer above Mean Sea-level $139\frac{1}{2}$ feet, above Ground $15\frac{1}{2}$ feet. During the MONTH of *September*, 1874.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		STILL-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		9 h. A.M.		9 h. P.M.		Max. in Shade, 4 feet above Ground.		Min. in Sunray, 4 ft. on Grass.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Temperature of Well at depth of feet. No.					Temperature at 1 fathom, and Density.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	No. 236	No. 237	No. 238	No. 239	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Direction.	Force.								No. 1.	No. 2.	No. 3.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† = 29.539
for Temp. (Col. 2), = 2.9.6.2.1. ... -0.082.
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 29.545
for Temp. (Col. 4), = 2.9.6.2.3. ... -0.083.
Mean at Station, corrected, and at 32° = 29.572 29.583
Correction for height, $139\frac{1}{2}$ feet above Mean Sea-level, = +0.152 20.112
Mean, reduced to 32°, and Sea-level, = 29.694 29.695
Highest Reading, corrected for Index error, on the 13th, = 30.127 30.168
Lowest Do. Do. on the 10th, = 29.093 29.136
Difference, or Monthly Range, = 1.032 1.032

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 17th, = 66.2
Lowest in Month, corrected for Index errors, on the 17th, = 36.3
Difference, or Monthly Range, = 29.9
“Corrected Mean” of all the Highest, (Col. 5), = 60.1
“Corrected Mean” of all the Lowest, (Col. 6), = 46.4
Difference, or Mean Daily Range, = 13.7
* Calculated Mean Temperature of Month, = 53.3
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 17th, = 30.5
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 30.5
Lowest at Night, Black Bulb, (corrected for Index errors), on the 17th, = 30.5
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 41.7
Difference of above Means or Range (“exposed”), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 53.2
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 51.4
†† Computed Temperature of Dew-Point, = 49.6
†† Do. Elastic Force of Vapour, = 0.355 in.
†† Do. Weight of Vapour in a Cubic Foot of Air, = 4.00 Grs
†† Relative Humidity, (Saturation = 100), = 87.6 88
RAINFALL on 21 Days; Amount in Inches, = 2.144
Rose Peak 2.330

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		1	0	0	0	4	17	2	6	0	1.50
P.M.		0	0	0	3	0	19	0	6	2	1.34
Mean.		1	0	0	1	2	18	1	6	1	1.42

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

Evaporation = 2.744 inches

Observations made and
Return verified by: *Alexander Beverley Assisted (on duty)*
(occasional) by several

(Signed) *Alex. Beverley*Greatest daily range 23.6 on the 17th

x Actual readings at Grammar School on same days
at same hours
Highest 30.164
Lowest 29.133
Range 1.036

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

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

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

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

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

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

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

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

Protection of Thermometers.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from every local influence. The back forming the sides and doors of the boxes are arranged so as at once to protect the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-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 from the opticians, Negretti and Zambra's Patent "Marium" Thermometers, and recommended: printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of the Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

from radiation during night. Their bulbs have a black coating which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Marium" 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; and the sun's heat to affect the Minimum Thermometer by distillation.

Registration of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are *not graduated* on the stem, but merely on an attached scale, 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 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 insulated by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite to the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—38°·9, 40°·0, or 40°·1; or again, 40°·4, 40°·5, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½, respectively. So also 40½, and 40¾, more or less must be registered 40°·2 and 40°·3, and 40°·7 and 40°·8 respectively. In reading Rutherford's "Max" and "Min" Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

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

Observations of the clouds 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 9, S. W." (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S. W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{2}{4}$, st. (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

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

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

Ozone.—Mention whether Schloibach's or Moffet's papers are used. The paper is affected by a pin to a board in the thermometer box, and these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3xx, as an ozone entry 3° on the scale, that the wind is from the N. W., and that its force on the scale 6 is "4"; i.e., that it is blowing fresh.

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

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

Besides special and extraordinary observations, green prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds; the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain; the hour of 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 observations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Diemometer should be entered in this manner or on the side-marginal. Additional remarks may be made on the margin.

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

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

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

The Council recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; to reject any instrument which, on being presented, for comparison, does not afford him satisfaction.

Dunfermline, 10th November 1892. (By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

EDINBURGH.

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

MR ALEXANDER BUCHAN,



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Hammerfield, Behanline Road, County of Aberdeen, in Lat. 57° 8' 3" N, Long. 2° 7' 35" W, Distance from Sea 2 1/4 miles.
 Height of Cistern of the Barometer above Mean Sea-level 139 1/4 feet, above Ground 15 1/4 feet. During the MONTH of October

The Hours of Observation are of Greenwich Time.

[illegible]

BAROMETER, "corrected Mean" at 9 A.M., <i>minus</i> the Correction $\uparrow \uparrow$ for Temp. (Col. 2), = <i>h. g. 4. g. 4. = 0.066.</i>	=	29.428	<i>at level of station</i>
"Corrected Mean" of Barometer at 9 P.M., <i>minus</i> the Correction $\uparrow \uparrow$ for Temp. (Col. 4), = <i>h. g. 4. g. 4. = 0.066.</i>	=	29.501	
Mean at Station, corrected, and at 32°,	=	29.464	29.505
Correction for height, $\frac{139\frac{1}{2}}{101.2}$ feet above Mean Sea-level,.....	=	+0.157	+0.113
Mean, reduced to 32°, and Sea-level,	=	29.618	29.618
Highest Reading, corrected for Index error, on the 30 th ,.....	=	30.375	30.417
Lowest Do. Do., on the 21 st ,.....	=	28.341	28.383
Difference, or Monthly Range,	=	2.034	2.034

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for	0
Index Errors), on the 7 th ,	= 59.3
Lowest in Month, corrected for Index errors, on the 31 st ,	= 28.9
Difference, or Monthly Range,	= 30.4
" Corrected Mean " of all the Highest, (Col. 5),	= 57.4
" Corrected Mean " of all the Lowest, (Col. 6),	= 39.1
Difference, or Mean Daily Range,	= 15.3
** Calculated Mean Temperature of Month,	= 46.7

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 31st, = 24.4

"Corrected **Mean**," (Col. 8), of **Black Bulb, Min.** on grass, = 35.1

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

Evaporation = 2.129 inches

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb , (Cols. 9 and 11),	=	46. ⁰ 1
Mean (corrected) A.M. and P.M. Reading of Wet Bulb , (Cols. 10 and 12),	=	44. ⁰ 6
‡ Computed Temperature of Dew-Point ,	=	42. ⁰ 8
‡ Do. Elastic Force of Vapour ,	=	0.277 <i>lbs.</i>
‡ Do. Weight of Vapour in a Cubic Foot of Air , ...	=	3.20 <i>grs</i>
‡ Relative Humidity , (Saturation = 100),	=	89.5

RAIN fell on 22 Days, Amount in Inches, Rose Street = 2.289
2.440

WIND.										SUMMARY.	
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	0	0	0	3	14	5	8	1	1.4	
P.M.	0	1	0	2	1	13	3	9	2	1.226	
Mean.	0	1	0	1	2	13	4	8	2	1.313	1.72 <i>ltg</i>

Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
 Erasing corrections for both capillary and Index Errors.
 The Diurnal Range for Scotland is as yet unknown.
Practically, though not *absolutely a minus correction*, the Corrections are calculated from Glaisher's Hygrometrical Tables, Second Edition *only*.
 While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 5 and 6 will be entered as the "Calculated Mean Tem. perature."
 Corrections for the *other* Stations on the *other* side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See *over*.

*: actual readings at Gran. School, same days shown

Wilbert 30.403
 Lowell 28.408
 Camp 1.495

Observations made and
 Return verified by {

 Alex. Beverley, Assistant Sergt. Spruill

 Janitor Grammar School Aberdeen

(Signed) Alex. Beverly

Greatest daily range 21.7 on the 31st.

A

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Hammerfield, Cuparstone Road, County of Aberdeen*, in Lat. *57° 8' 3" N*, Long. *2° 7' 35" W*, Distance from Sea *2 1/2* miles.
 Height of Cistern of the Barometer above Mean Sea-level *139 1/4* feet, above Ground *15 1/4* feet. During the MONTH of *November* 187*4*.
 The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.	OZONE.	GENERAL REMARKS.	Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulb.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	No. 7332	Min. No. 107	Max. in Sun's rays No. 7332	Min. on Black Bulb No. 7332	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			Velocity (0-10).	Amount (0-10).	Velocity (0-10).	Amount (0-10).	No. 12	No. 22	No. 22																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.679
 for Temp. (Col. 2), = 2.9.7.3.4 - 0.055...
 "Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.649
 for Temp. (Col. 4), = 2.9.7.3.4 - 0.055...
 Mean at Station, corrected, and at 32°, = 29.664 29.706
 Correction for height, 139 1/4 feet above Mean Sea-level, = +0.136 +0.114
 Mean, reduced to 32°, and Sea-level, = 29.820 29.820
 Highest Reading, corrected for Index error, on the 1st th, = 30.191 30.234
 Lowest Do. Do. on the 29 th, = 28.713 28.755
 Difference, or Monthly Range, = 1.478 1.479

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 5 th, = 58.1
 Lowest in Month, corrected for Index errors, on the 1st th, = 27.5
 Difference, or Monthly Range, = 30.6
 "Corrected Mean" of all the Highest, (Col. 5), = 46.7
 "Corrected Mean" of all the Lowest, (Col. 6), = 36.3
 Difference, or Mean Daily Range, = 10.4
 ** Calculated Mean Temperature of Month, = 41.5
 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 22nd, = 24.6
 "Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 32.5
 Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 40.7
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 39.6
 ‡ Computed Temperature of Dew-Point, = 38.2
 ‡ Do. Elastic Force of Vapour, = 0.231 in
 ‡ Do. Weight of Vapour in a Cubic Foot of Air, = 2.71 2.68 grs
 ‡ Relative Humidity, (Saturation = 100), = 91.4
 RAIN fell on 24 Days; Amount in Inches, = 3.613
 WIND. SUMMARY.
 Direction. N NE E SE S SW W NW Variable. Mean Force. Mean Velocity in miles per day.
 A.M. 2 3 0 2 2 12 2 5 2 1.22
 P.M. 0 2 1 1 1 9 3 11 2 1.23
 Mean. 1 2 1 2 1 11 2 8 2 1.22 = 1.4964

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
 † Enabling corrections for both capillarity and Index Errors.
 ‡ The Diurnal Range for Scotland is as yet unknown.
 ‡ These "Hygrometrical Deductions" are calculated from Glashier's Hygrometrical Tables, Second Edition only.
 ‡ While the Diurnal Range is unknown, the Artificial Mean of Cols. 9 and 6 will be entered as the "Calculated Mean Temperature."
 ‡ Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

Observations made and Return verified by *Alex. Beverley, assisted by Sanitor of Grammar School, Aberdeen.*
N.B. The Sanitor has been changed during the month.

(Signed) *Alex. Beverley*
 Greatest daily range 22.7 on the 1st

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Hammerfield, Cupans Road, County of Aberdeen, in Lat. 57° 8' 3" N, Long. 2° 7' 35" W, Distance from Sea 24 miles.
Height of Cistern of the Barometer above Mean Sea-level 139 1/2 feet, above Ground 15 1/2 feet. During the MONTH of December 1875.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	13. J. BAROMETER.				SELF-REGISTERING THERMOMETERS Read Daily, at 9 P.M.				HYGROMETER. No. 2237				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.	OZONE.	GENERAL REMARKS.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		9 h. A.M.		9 h. P.M.		Protected in Shade, at least above Ground.		Exposed Black Bulbs, 9 A.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.		9 h. P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
		Barometer. No. 236	Atmospheric Thermometer.	Barometer. No. 236	Atmospheric Thermometer.	Max. No. 233	Min. No. 207	Max. No. 233	Min. No. 207	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-10).	Amount (0-10).	Direction.	Amount (0-10).	Direction.	Amount (0-10).	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of Well at depth of feet. No.						Temperature at 1 fathom, and Density.	9 A.M.	9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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	1	29.310	44.0	29.484	42.5	39.8	31.4	29.9	34.0	32.4	34.8	33.9	NE	2	SW	1	SW	3	6	0.130													Snow, hail.	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	2	29.732	41.3	29.770	42.3	35.5	26.7	24.0	29.9	29.0	29.0	29.0	SW	1	SW	1	SW	2	3	0.010														Snow	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	3	29.656	43.9	29.788	43.6	41.5	27.1	22.8	38.1	36.4	38.0	36.0	SW	1	SW	1	SW	1.5	2	0.015														Bellant Meteor 8.30 P.M.	3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	4	29.510	44.0	29.300	47.1	47.5	34.1	30.0	38.6	38.1	41.3	40.0	SW	1	SW	0.5	SW	2	0	0															4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	5	29.202	47.1	29.128	48.0	44.0	33.5	31.3	39.7	39.0	37.3	34.3	SW	1	SW	1.5	SW	2	0	0															5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	6	29.104	47.1	29.114	46.0	41.0	29.9	25.6	33.0	32.0	35.0	33.7	SW	0.5	SW	1	SW	1	0	0															6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	7	29.196	44.2	29.516	43.0	39.5	30.3	25.3	31.8	31.0	34.7	33.3	SW	0.5	SW	2	SW	3	0	0															Hft. aw.	6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	8	29.454	43.2	29.016	43.7	40.3	27.6	23.3	29.7	28.7	40.0	36.5	SW	0.5	SE	2	SE	2.5	2	0.010															Hft. aw.	7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	9	29.170	43.3	29.430	43.7	40.5	30.0	25.8	34.1	33.9	32.2	31.8	SW	1.5	N	1	SW	2	4	0.125															Hft. aw.	8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	10	29.512	41.7	29.330	42.2	35.5	23.5	21.7	27.7	27.0	27.0	26.0	SW	1	N	0.5	SW	1.5	2	0.010															Hail, snow aw.	9																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	11	28.734	41.0	28.868	44.0	40.0	26.4	20.8	36.9	35.6	38.7	38.0	SE	2.5	E	2	SE	5	10	0.185															Snow	10																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	12	29.216	44.5	29.436	45.0	40.3	33.8	33.1	38.9	37.9	37.3	35.3	SE	1.5	SE	1	SE	2	6	0.225															Sleet, snow, fog	11																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	13	29.630	44.6	29.836	42.6	39.3	31.0	28.8	32.9	32.9	35.3	34.9	NE	0.5	E	0.5	NE	1	6	0.165															Sleet, hail. s.o.ha. noon	12																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	14	29.958	43.9	30.002	42.2	37.0	29.2	27.3	35.0	34.8	30.0	29.0	SW	1	SW	0.5	SW	1.5	8	0.380															Snow, hail, much sun 10 Am.	13																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	15	29.922	41.7	29.620	41.4	36.3	22.1	20.3	23.2	23.1	35.3	34.7	SW	0.5	SW	1.5	SW	2	8	0.380																Sleet aw.	14																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	16	29.880	43.0	30.102	42.8	37.4	28.2	20.6	35.4	33.3	31.6	31.3	E	1	NE	0.5	SE	1.5	6	0.108																Hft.	15																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	17	30.240	42.5	30.160	42.8	35.6	24.1	26.4	30.2	29.0	25.8	25.7	NE	1	N	1	NE	1.5	2	0.010																Snow, hail. s.o.ha. 10-11 Am.	16																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	18	29.724	42.2	29.658	43.6	40.6	24.2	23.0	35.9	35.8	38.7	37.0	SW	1.5	SW	1.5	SW	3	2	0.015																	Snow Cu. ha. 9 P.M.	17																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	19	29.730	44.2	29.516	42.5	39.1	29.1	25.4	30.7	30.0	34.0	34.0	SW	1	SW	2	SW	3	4	0.165																	Sleet	18																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	20	29.372	42.3	29.390	41.8	38.2	31.0	28.1	34.2	33.6	32.3	32.1	SW	1.5	N	0.5	SW	1.5	6	0.230																	Snow	19																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	21	29.348	42.0	29.606	43.2	37.0	31.1	27.4	34.0	34.0	32.7	32.5	SW	1	E	1	SW	1.5	8	0.420																	Snow	20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	22	29.726	43.3	29.826	44.0	35.6	25.7	24.4	27.4	27.4	33.3	33.3	N	0.5	N	0.5	N	1	3	0.010																	Snow, hail	21																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	23	29.788	44.7	29.606	44.0	34.0	12.0	27.8	30.4	30.4	14.5	13.0	SW	0.5	SW	0.5	SW	1	0	0																	Snow	22																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	24	29.452	43.4	29.450	43.8	30.9	13.5	11.0	28.4	28.2	29.0	28.9	SW	0.5	SW	0.5	SW	1	0	0																		23																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	25	29.560	43.8	29.648	44.9	34.7	19.5	19.8	31.4	31.0	21.7	21.7	SW	1	SW	0.5	SW	1	0	0																		24																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	26	29.736	42.1	29.888	42.6	36.9	19.0	16.6	22.7	22.7	28.6	28.6	SW	1	N	0.5	SW	1	1	0.035																		25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	27	29.950	43.9	30.028	41.2	37.7	26.2	19.9	29.0	28.6	31.0	30.4	SW	1	SW	1	SW	2	1	0.005																		26																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	28	30.034	41.7	30.090	41.8	36.0	27.2	23.6	32.0	32.0	31.0	30.8	SW	1	SW	1	SW	1.5	4	0.090																		27																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	29	30.140	44.4	30.256	42.0	36.9	21.4	21.6	29.4	29.4	36.3	34.8	SW	0.5	E	1.5	SW	2	5	0.060																		28																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	30	30.312	42.2	30.264	42.8	36.7	28.0	20.2	31.2	31.2	32.7	32.5	E	0.5	E	1	SE	2.5	8	0.335																		29																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	31	30.126	44.3	30.096	41.8	34.0	16.9	27.9	28.6	28.6	17.7	17.5	NE	1	NE	0.5	NE	1.5	2	0.010																		30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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	Sums.	918.424	1343.5	919.252	1342.9	1179.3	813.7	753.7	944.4	948.1	968.8	970.5		31.0		31.0		101	2.755																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							</

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.573
for Temp. (Col. 2), = 2.9... - 0.039...
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.601
for Temp. (Col. 4), = 2.9... - 0.039...
Mean at Station, corrected, and at 32°, = 29.588 29.630
Correction for height, 139 1/2 feet above Mean Sea-level, = +0.159 40.117
Mean, reduced to 32°, and Sea-level, = 29.747 29.747
Highest Reading, corrected for Index error, on the 30 th, = 30.299 30.342
× Lowest Do. Do., on the 11 th, = 28.721 28.763
Difference, or **Monthly Range**, = 1.578 1.579

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month**, (corrected for Index Errors), on the 4 th, = 47.5
Lowest in Month, corrected for Index errors, on the 23 th, = 12.1
Difference, or **Monthly Range**, = 35.6
"Corrected Mean" of all the Highest, (Col. 5), = 38.2
"Corrected Mean" of all the Lowest, (Col. 6), = 26.4
Difference, or **Mean Difference**, = 11.8
* Calculated Mean Temperature of Month, = 32.3
S.-R. THERMOMETER, **Black Bulb in Sun, Highest**, (corrected for Index Errors), on the th, =
"Corrected Mean," (Col. 7), of **Black Bulb, Max. in Sun**, =
Lowest at Night, **Black Bulb**, (corrected for Index errors), on the 24 th, = 10.8
"Corrected Mean," (Col. 8), of **Black Bulb, Min. on grass**, = 24.1
Difference of above Means or Range ("exposed"), =

HYGROMETER, **Mean** (corrected) A.M. and P.M. Reading of **Dry Bulb**, (Cols. 9 and 11), = 32.1
Mean (corrected) A.M. and P.M. Reading of **Wet Bulb**, (Cols. 10 and 12), = 31.4
†† Computed **Temperature of Dew-Point**, = 29.8
†† Do. **Elastic Force of Vapour**, = 0.166 in.
†† Do. **Weight of Vapour in a Cubic Foot of Air**, = 1.98 grs
†† **Relative Humidity**, (Saturation = 100), = 91.0
RAIN fell on 23 Days; Amount in Inches, = 2.753
Rose Street 3.010
WIND. SUMMARY.
Direction. N NE E SE S SW W NW Variable. Mean Force. Mean Velocity in miles per day.
A.M. 1 4 2 2 0 9 3 10 0 1.00
P.M. 5 2 5 2 0 3 6 8 0 1.00
Mean 3 3 3 2 0 6 5 9 0 1.00-1.00 lbs

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

× 11th at 1.15 P.M. Bar. 28.662; 41.4 :- No. 10 SSE 3
(no corrections applied)
Observations made and Return verified by { Alex. Beverley (clerk and part of the)
Remarks by Mr. A. C. Crichton (clerk.)
N.B. Col. 6. Min. 107 S.W.S. has been rectified. Its correction is as before +0.1

(Signed) Alex. Bever

WITH REMARKS ON THE USE OF INSTRUMENTS.

Self Registering Thermometers.—Professor Phillips, of 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 and should be affixed to these Thermometers by the "*Maximum*." It is recommended that these Thermometers be graduated on the glass stem. The "*Minimum*" Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by sucking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will found in the upper lobes, and must be

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

The Council recommends that *term* day observations be taken—viz., on the 23rd days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council recommend observers, before purchasing new instruments, to confer with the makers, and to ascertain the best way to observe it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

[illegible]

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

BOOK POST.

EDINBURGH.

Secretary of the Meteorological Society of Scotland.

MR. ALEXANDER BUCHAN.

$$T_{\phi}$$

Dec 1844 -
Shedden - 2