SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gordon's Hospital, Aberdeen, County of Aberdeen, in Lat. 57° 9' N, Long. 2° 6' W, Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of January 1879.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Mouth.	BAROMETER. 9 h. A.M. Barometer. * No.___	Attached Thermometer	9 h. P.M. Barometer. No.___	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.___	Min. No.___	Exposed Black Bulbs. Max. in Sun's rays No.___	Min. on Grass. No.___	HYGROMETER. No.___ 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	___ P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No.___ 3 inches.	12 inches.	No.___ 22 inches.	Temperature of WELL at depth of ___ feet. No.___	SEA. Temperature at 1 fathom, and Density,	OZONE. ..... 0—10. 9 A.M.	9 P.M.	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 Mouth.
		inches.	°	inches.	°	°	°	°	°	°	°	°	°																										
	1	29.590	36.0	29.644	33.7	32.6	24.8			30.2	27.1	28.7	26.5	N.W.	1½	N.W.	1			.00		1 cu		0		5													1
	2	29.702	34.7	29.744	35.1	31.0	24.9			30.2	29.0	29.6	26.1	N.W.	1½	N.W.	1			.04		2 cl		2 cu		4												Snow	2
	3	29.476	28.2	29.412	33.8	29.8	16.0			20.9	18.7	29.6	28.1	N.W.	1½	~	0			.21		10 cl-cu		10 st		3													3
	4	29.514	37.9	29.764	36.8	36.2	26.8			36.1	35.0	34.8	33.1	N.W.	3	W.	4			.05		10 cl-cu 6		2 cu 10		2												Strong gale at 12 P.M. of 4th	4
	5	29.880	37.6	30.046	38.2	36.7	29.0			36.1	35.1	36.4	35.3	N.W.	1	N.W.	1			.01		cl-cu 9		10 st		2													5
	6	30.178	37.3	30.146	39.8	37.8	31.4			35.0	34.2	38.0	35.4	N.W.	1	N.W.	½			.0		cu-st 10		10 st		2												Lunar Halo	6
	7	30.036	38.7	29.824	37.1	38.3	31.2			37.6	35.0	34.7	32.0	S.	4	S.E.	4			.00		8 st 10		10 st 8		0												Strong gale all day	7
	8	29.844	37.0	30.086	38.3	36.8	33.0			37.0	33.8	36.6	34.0	S.E.	3	S.E.	2			.0		8 st 10		cu 10		1													8
	9	30.170	38.7	30.022	38.4	37.4	34.1			37.0	34.3	35.6	31.8	S.E.	2	S.E.	2½			.04		8 st 8		st 10		0													9
	10	29.854	37.0	29.680	37.2	35.0	31.2			34.7	32.1	34.6	32.1	S.E.	4	S.E.	4			.06		cu-st 10		st 10		1													10
	11	29.664	37.1	29.748	37.0	35.2	30.8			33.0	32.1	33.6	32.2	S.E.	1	~	0			.11		10 st 2		st 10		0													11
	12	29.886	36.3	29.812	37.4	36.4	25.0			26.6	25.4	36.2	32.4	N.W.	1	W.	3			.18		cl-cu 6		st 10		4													12
	13	29.698	38.0	29.838	38.9	40.0	33.7			35.1	34.2	37.0	35.4	S.W.	1	S.	1			.01		cl 10		0 ~		4													13
	14	29.684	41.3	29.428	32.1	40.8	33.7			40.0	39.1	40.8	40.0	S.	2½	S.	2			.39		10 st		10 st		0													14
	15	29.358	39.4	29.638	42.6	40.0	35.0			37.1	36.2	40.0	36.1	S.W.	1	S.W.	1			.0		10 st		0 st		0													15
	16	29.846	36.2	29.998	37.2	37.0	30.0			32.1	30.8	32.3	31.7	W.	1	W.	1			.0		1 st		0 ~		4													16
	17	30.122	34.2	30.030	40.8	39.1	25.9			29.6	27.9	39.0	36.3	W.	½	S.E.	4			.02		4 cu-st		10 st		3													17
	18	29.968	39.8	30.238	39.8	39.0	36.5			38.3	36.2	38.0	36.1	S.E.	4	S.	3			.06		10 st		10 st		0													18
	19	30.366	39.1	30.296	39.0	37.4	34.4			37.1	34.1	36.8	33.9	S.E.	3	S.	3			.0		10 st		10 st		1													19
	20	30.230	38.0	30.088	37.4	37.6	32.2			35.0	32.7	35.9	34.2	S.W.	2	S.W.	3			.03		9 cu-st		10 st		0													20
	21	30.108	38.0	30.220	37.4	37.0	32.6			35.0	33.0	34.5	33.2	S.E.	1	~	0			.03		5 cl		10 st		2												Snow	21
	22	30.194	35.2	30.178	36.3	32.0	28.0			29.1	27.1	31.7	29.8	N.E.	½	~	0			.04		10 st		10 st		0												Snow	22
	23	30.114	39.0	30.046	31.4	32.1	27.6			29.1	28.0	30.0	29.1	W.	1	W.	1			.0		2 st		10 st		3													23
	24	30.066	31.2	30.136	34.0	30.6	25.0			26.9	26.2	29.9	29.1	W.	½	~	0			.0		3 cu-st		10 st		3													24
	25	30.160	33.4	30.090	32.0	32.3	27.3			31.0	30.3	28.5	28.0	W.	1	S.W.	2			.0		10 st		0 ~		0													25
	26	30.086	32.4	30.212	33.3	32.0	26.8			28.9	28.1	30.0	29.8	~	0	S.W.	2			.0		3 st		0 ~		5													26
	27	30.324	32.1	30.376	34.6	34.1	25.0			26.4	26.2	31.3	30.2	S.W.	½	S.W.	½			.0		4 ~		4 cl		4													27
	28	30.290	38.1	30.196	38.9	38.9	30.1			36.2	35.0	35.3	34.6	W.	½	~	0			.10		1 st		10 st		5													28
	29	30.448	38.4	30.502	37.8	36.8	34.0			36.2	34.2	35.7	34.2	S.E.	1½	~	0			.03		10 st		10 st		0													29
	30	30.474	37.8	30.410	38.0	37.1	33.9			36.4	34.1	37.4	35.6	S.E.	2	S.E.	1½			.04		8 st		10 Nim		0													30
	31	30.320	36.9	30.194	35.9	36.0	33.1			34.3	33.2	34.3	33.8	S.E.	1	S.W.	1			.08		7 cl-cu		10 Nim		0													31
Sums.		929.650	1134.9	930.043	1130.3	1113.0	921.3			1028.2	978.4	1085.0	1009.1					49.0	5	1.63	7																		
Means.		29.987	36.6	30.001	37.0	35.9	29.7			33.2	31.6	34.4	32.5					1.58						6.8		7.3												
† Total Corrections for Instrumental Errors.		+0.006	-.4	+0.006	-0.7	-0.2	+0.1			-0.1	-0.1	-0.1	-0.1												7.0													
‡ Corrections for Diurnal Range.																																						
"Corrected Means."		29.995	35.9	30.007	36.3	35.7	29.8			33.1	31.5	34.3	32.4																									
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction†† for Temp. (Col. 2), = 29.995 ..... − 0.020 } = 29.975

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 30.007 ..... − 0.020 } = 29.987

Mean at Station, corrected, and at 32°, ... = 29.981

Correction for height, 66 feet above Mean Sea-level, ... = 0.075

Mean, reduced to 32°, and Sea-level, ... = 30.056

Highest Reading, corrected for Index error, on the 29 th, 9 P.M. = 30.508

Lowest Do. Do., on the 15 th, 9 A.M. = 29.364

Difference, or **Monthly Range,** ..... = 1.144

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 14 th, ... = 40.5

Lowest in Month, corrected for Index errors, on the 3 rd, } cor.! ..... = 16.5

Difference, or **Monthly Range,** ..... = 24.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 35.7

"Corrected **Mean**" **of all the Lowest,** (Col. 6), ... = 29.8

Difference, or **Mean Daily Range,** ..... = 5.9

** Calculated **Mean Temperature** of Month, ... = 32.7

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 th, ... =

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), ... = 33.7

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), ... = 32.0

‡‡ Computed **Temperature of Dew-Point,** ..... = 29.0

‡‡ Do. **Elastic Force of Vapour,** ..... = .159

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 1.93

‡‡ **Relative Humidity,** (Saturation = 100), ... = 83

RAIN fell on 19 **Days; Amount in Inches,** ..... = 1.63 inches

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	1	0	10	2	4	6	7	1	1.58	
P.M.	0	0	0	6	4	6	4	4	7	1.58	
Mean.	0	0	0	8	3	5	5	6	4	1.58 = 2.50	

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.;" and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
†† *Practically,* though not *absolutely a minus* correction.
‡‡ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only.*
** While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 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.*

Observations made and Return verified by }

(Signed) W.

Greatest Daily Range = 13.8 on the 3rd

W.

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer.

In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40½°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

Wind.

1. As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

———— will indicate that the upper strata of Clouds travel with 2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second 4, st.

Cloud column, an entry of———, will indicate that the higher 2, cu-st.

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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells, when practicable, to be taken, both the depth of the Well and of the water being noted.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc.

Ozone.

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 $3^{\frac{2}{6}}$, 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—5 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general 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 Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

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

FRUITS.	First in Blossom.	Fruit Ripe, generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Bleed.
Barley,				
Bere or Bigg,				
Oats,				
Wheat,				
Beans,				
Pease,				
Potatoes,				
Turnips,				
Rye Grass,				

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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

Mr ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland,
EDINBURGH.

BOOK POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gordons Hospital, Aberdeen, County of Aberdeen, in Lat. 57°7' N., Long. 2°6' W, Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of February 1879.

The Hours of Observation are of Greenwich Time.

Days of Month	BAROMETER. 9 h. A.M. Barometer. * No.___	BAROMETER. 9 h. A.M. Attached Thermometer	BAROMETER. 9 h. P.M. Barometer. No.___	BAROMETER. 9 h. P.M. Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.___	Protected in Shade, 4 feet above Ground. Min. No.___	Exposed Black Bulbs. Max. in Sun's rays No.___	Exposed Black Bulbs. Min. on Grass. No.___	HYGROMETER. No.___ 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H. Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	9 P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches.	12 inches.	No. 22 inches.	Temperature of WELL at depth of ___ feet. No.	SEA. Temperature at 1 fathom, and Density,	OZONE. 0—10. 9 A.M.	9 P.M.	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
	inches.	°	inches.	°	°	°	°	°	°	°	°	°																							
1	30.072	34.8	29.984	35.0	35.7	30.0			33.2	31.5	32.2	30.4	W.	½	—	0		.04		4/ci		9/ci	4							Lunar halo - diameter 45° - 9. P.M.	1
2	29.870	37.1	29.838	37.4	36.0	30.1			34.9	33.0	36.0	34.1	S.E.	1	S.E.	1½		.03		10/st		10/st	0							Snow	2
3	29.854	37.8	29.890	38.2	37.0	33.8			36.1	34.1	35.0	32.1	E.	2	E.	1		.01		10/st		10/st	0								3
4	29.956	36.9	29.830	34.6	36.0	31.2			33.2	32.1	33.4	31.0	—	0	W	1		0		6/ci-cu		10/st	3								4
5	29.520	37.8	29.242	37.2	37.0	31.5			34.9	32.3	37.2	36.0	S.W.	2	S.W.	2		.01		10/st		4/ci	0								5
6	28.878	40.7	28.956	43.8	44.0	35.2			40.8	39.6	44.0	41.7	S.W.	2½	N.W.	2		.01		10/st		1/ci	2								6
7	28.996	41.8	28.896	41.6	45.0	37.0			41.2	40.2	39.0	37.2	S.W.	2	S.W.	1		0		10/st		4/ci	4								7
8	29.058	39.7	29.164	41.2	41.9	35.0			36.9	35.8	37.2	34.6	—	0	—	0		0		5/ci		0/—	5								8
9	29.196	34.8	29.148	41.4	41.9	28.9			31.0	30.0	39.9	38.7	—	0	S.	1½		.02		6/ci-st		10/st	4							Hoar frost	9
10	28.848	39.8	28.810	41.2	41.0	34.2			38.6	37.4	40.0	38.9	S.E.	½	—	0		.07		10/st		10/st	0							Dense fog most of the day.	10
11	28.960	39.7	29.270	40.9	38.0	34.0			36.7	35.0	36.0	34.7	N.E.	1½	N.E.	1½		.01		9/cu-st		10/st	1								11
12	29.590	40.9	29.780	40.1	40.0	34.1			37.4	35.5	35.3	33.8	N.W.	1	—	0		.0		4/ci-st		0/—	4								12
13	29.752	35.0	29.638	39.4	38.5	28.0			31.2	29.5	38.3	36.0	—	0	S.E.	3		.02		10/st		10/st	0							Hoar frost - fog	13
14	29.752	40.0	29.768	40.2	40.0	36.5			38.3	36.4	38.1	35.7	E.	2	S.E.	2		.01		10/st		10/st	0								14
15	29.566	39.0	29.210	38.7	38.0	35.0			37.6	36.6	37.0	35.1	S.E.	3	S.E.	4		.10		10/st		10/st	0							Sleet	15
16	29.152	38.2	29.104	38.3	37.0	34.8			36.1	35.0	36.9	35.5	S.E.	3	S.E.	3		.44		10/st		10/st	0								16
17	29.042	37.2	29.084	37.1	35.2	31.8			35.0	33.9	33.0	32.1	E.	3	E.	3		.10		10/st		10/st	0							Snow	17
18	29.212	37.0	29.280	36.8	33.0	30.0			31.8	30.0	31.6	29.0	E.	2	S.E.	1½		.08		10/st		10/st	0							Heavy snow	18
19	29.222	36.3	29.060	36.2	33.7	27.0			28.1	27.0	30.7	29.6	S	1	—	0		.0		2/ci		0/—	4								19
20	29.046	27.0	29.162	36.2	33.2	26.9			23.0	22.0	31.7	30.8	—	0	—	0		.27		0/—		10/st	5							Snow	20
21	29.228	36.3	29.246	36.0	35.2	30.2			34.0	32.0	32.1	30.0	S	1½	S.	1		.0		10/st		4/cu-st	0							Heavy snow	21
22	29.262	29.1	29.400	37.0	34.5	22.7			25.2	24.3	30.1	28.5	W.	1	W.	1		.13		0/—		0/—	4							Snow	22
23	29.556	38.1	29.640	38.7	38.0	28.0			36.0	33.0	36.9	35.3	N.W.	1	N.E.	1½		.10		9/st		0/—	1							Snow	23
24	29.830	38.4	30.074	34.8	36.7	20.8			36.0	33.1	31.0	29.8	E.	2	E.	1		0		9/cu-st		0/—	2								24
25	30.170	35.0	30.208	37.0	36.0	27.8			32.1	30.8	34.0	32.2	—	0	—	0		0		8/ci		10/cu-st	5								25
26	30.104	30.5	29.898	38.2	37.8	21.5			25.4	23.5	36.6	35.4	N.W.	1	—	0		.07		4/ci-st		10/st	3								26
27	29.740	40.0	29.534	41.4	45.6	35.0			38.7	37.6	42/38	38.0	W.	1	W.	1		0		5/cu-st		9/cu-st	8								27
28	29.600	39.2	29.702	41.0	43.0	34.8			36.9	35.0	35.0	35.0	W.	½	W.	1		0		2/ci-st		4/cu	4								28
29																																			29
30																																			30
31																																			31
Sums.	825.232	1038.1	824.816	1079.6	1068.9	869.8			959.7	914.6	1000.4	951.2		350		345		1.52		203		185	66								
Means.	29.477	37.1	29.458	38.6	38.2	31.1			34.3	32.7	35.7	33.9		1.25		1.23				7.2		6.6									
† Total Corrections for Instrumental Errors.	+0.006	-0.7	+0.006	-0.7	-0.2	+0.1			-0.1	-0.1	-0.1	-0.1		06		06						6.9									
‡ Corrections for Diurnal Range.																																			
"Corrected Means."	29.478	36.4	29.464	37.9	38.0	31.8			34.2	32.6	35.6	33.9																							
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction †† for Temp. (Col. 2), = 29.477 — 0.020 = 29.457

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.464 — 0.020 = 29.444

Mean at Station, corrected, and at 32°, = 29.451

Correction for height, 66 feet above Mean Sea-level, = 0.074

Mean, reduced to 32°, and Sea-level, 29.519 = 29.519

Highest Reading, corrected for Index error, on the 25 th, = 30.214

Lowest Do. Do., on the 9 th, = 28.816

Difference, or **Monthly Range,** = 1.398

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 27 th, 45.4 = 45.4

Lowest in Month, corrected for Index errors, on the 20 th, 21.0 = 20.4

Difference, or **Monthly Range,** 24.4 = 25.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), 38.0 = 38.0

"Corrected **Mean**" **of all the Lowest,** (Col. 6), 31.2 = 31.8

Difference, or **Mean Daily Range,** 6.8 = 6.2

** Calculated **Mean Temperature** of Month, 34.6 = 34.8

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 34.9

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 33.2

‡‡ Computed **Temperature of Dew-Point,** = 30.4

‡‡ Do. **Elastic Force of Vapour,** = .169

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 1.92

‡‡ **Relative Humidity,** (**Saturation** = 100), = 83

RAIN fell on 18 **Days; Amount in Inches,** = 1.52

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	1	5	4	2	3	4	2	6	1.25	
P.M.	0	2	3	6	2	2	4	1	8	1.23	
Mean.	0	2	4	5	2	2	4	2	7	1.24 = 1.54 lb	

SUMMARY.

Greatest Daily Range = 16.0 on the 26th

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.;" and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
†† *Practically*, though not *absolutely* a *minus* correction.
‡‡ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only*.
** While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 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.*

Observations made and Return verified by James Dale Teacher Gordons Hospital Aberdn

(Signed) James Dale

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer. In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or $40\frac{1}{2}$°, respectively. So also $40\frac{1}{4}$°, and $40\frac{3}{4}$°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6,\ S.W.}{2,\ W.}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4,\ st.}{2,\ cu\text{-}st.}$, will indicate that the higher regions are covered to the amount of 4-tenths with stratus Clouds; and that the sky is further obscured to the extent of 2-tenths by lower Clouds of the cumulo-stratus kind.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, observation may be made on the 5th, 15th, and 25th of each month. When convenient, extra Sea Observations might be taken farther out and greater depths, noting always the Temperature of the Air, and the Hour of Observation. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. 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 $3\frac{N.W.}{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—5 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, December 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

Aberdeen
Feb 1879

3

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Aberdeen, County of Aberdeen, in Lat. _____, Long. _____, Distance from Sea _____ miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground _____ feet. During the MONTH of March 1879.

The Hours of Observation are of Greenwich Time.

Days of Month	BAROMETER. 9 h. A.M. Barometer. * No.____	BAROMETER. 9 h. A.M. Attached Thermometer	BAROMETER. 9 h. P.M. Barometer. No.____	BAROMETER. 9 h. P.M. Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.____	Min. No.____	Exposed Black Bulbs. Max. in Sun's rays No.____	Exposed Black Bulbs. Min. on Grass. No.____	HYGROMETER. No.____ 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No.____ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.____	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	6 P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No.____ 3 inches.	No.____ 12 inches.	No.____ 22 inches.	Temperature of WELL at depth of ____ feet. No.____	SEA. Temperature at 1 fathom, and Density,	OZONE. 0—10. 9 A.M.	9 P.M.	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
	inches.	°	inches.	°	°	°	°	°	°	°	°	°													°	°	°	°	°					
1	29.904	39.7	29.792	40.8	39.0	30.0			33.7	30.3	38.2	35.2	N.W.	1	N.W.	2			.18		0 ci	9 ci-cu	4										1
2	29.660	41.3	29.520	45.8	44.0	36.6			39.8	38.4	43.9	41.9	S.W.	3	S.W.	2			0		10 st	10 st	2										2
3	29.488	40.1	29.630	41.2	45.0	33.5			38.1	35.7	35.0	32.3	S.W.	2	W.	1			0		10 st	4 ci	8										3
4	29.348	42.8	29.510	47.3	51.2	33.6			41.3	39.9	45.2	40.6	W.	3	S.W.	2			.28		10 st	0	6										4
5	29.372	43.6	29.240	45.4	50.2	39.2			42.3	41.6	40.7	38.7	S.	1	W.	3			0		10 st	0	3										5
6	29.888	40.8	29.892	43.1	46.6	35.0			38.8	36.3	41.3	38.4	W.	1	W.	2			.01		8 cu-st	0	2										6
7	30.198	40.1	30.392	43.2	50.9	37.0			43.0	39.1	46.6	42.0	S.W.	1	S.W.	1			0		0	10 st	5										7
8	30.340	44.0	30.198	47.5	50.0	36.0			41.0	38.0	44.4	41.1	S.W.	½	S.W.	1			0		6 cu-st	0	4										8
9	30.036	50.0	30.052	47.2	49.6	40.8			48.7	42.1	42.6	38.8	W.	3	W.	1			0		1 ci	4 ci-st	7										9
10	29.976	45.8	29.960	44.0	47.0	38.9			44.1	39.9	40.6	37.1	W.	1	N.W.	½			.04		9 cu-st	4 ci-cu	5										10
11	30.192	40.2	30.066	44.8	42.8	31.5			35.2	31.0	38.0	36.7	N.W.	½	N.W.	1			.45		0	10 st	7										11
12	29.528	43.1	30.098	39.1	37.2	27.5			35.9	35.2	29.8	28.1	E.	2	N.E.	3			.18		10 st	0	1										12
13	30.214	39.1	30.242	39.0	31.2	26.0			29.6	27.1	27.2	26.3	N.W.	2	N.W.	1			.01		5 cu	10 st	2										13
14	30.140	36.2	29.866	37.5	33.4	26.2			30.0	29.1	31.6	31.0	N.W.	1	E.	1			.44		10 st	10 st	4										14
15	29.576	37.4	29.632	37.2	35.9	27.0			32.7	32.3	33.8	32.6	E.	1	E.	2			.08		10 st	10 st	0										15
16	29.828	39.0	30.026	40.3	39.0	31.8			37.1	33.0	36.0	33.0	E.	1	E.	1			.0		9 cu	4 cu	4										16
17	30.114	37.0	29.966	38.0	38.9	32.2			35.8	33.6	34.9	33.1	S.E.	1	S.E.	2			.02		10 st	0	0										17
18	29.780	38.5	29.736	41.2	41.0	33.8			36.9	36.1	38.5	37.8	S.	1	S.	½			.09		10 st	5 st	3										18
19	29.756	40.6	29.902	42.6	40.0	36.8			39.0	38.6	39.4	39.0	S.E.	½	—	0			.04		10 st	10 st	0										19
20	29.988	42.3	29.962	42.0	40.9	37.0			39.1	38.5	40.0	38.9	E.	½	—	0			.02		10 st	0	0										20
21	29.920	40.1	29.960	40.3	41.6	37.0			38.9	38.1	38.3	37.2	—	0	E.	½			.01		10 st	10 st	0										21
22	30.122	37.2	30.142	37.3	40.0	34.9			37.0	33.8	36.0	33.3	S.E.	1½	S.E.	2			0		9 cu-st	3 ci	6										22
23	30.200	37.8	30.228	37.7	38.6	33.4			37.0	33.3	34.7	31.4	S.E.	2	S.E.	2			0		4 cu	10 st	4										23
24	30.214	37.0	30.202	35.8	36.2	32.9			35.0	31.8	34.4	32.8	S.E.	2	S.E.	2			.01		10 st	10 st	0										24
25	30.126	35.2	30.032	36.8	35.8	32.2			34.8	31.3	34.1	31.6	S.E.	3	S.E.	3			.01		10 st	10 st	0										25
26	29.992	36.8	29.948	37.0	38.2	32.0			35.8	32.4	33.3	32.2	S.E.	2	S.E.	1½			.05		9 cu-st	3 ci	4										26
27	29.898	37.0	29.830	37.5	38.0	30.1			34.4	31.9	32.0	30.8	S.E.	3	S.E.	1			.04		9 cu-st	3 cu	4										27
28	29.724	37.6	29.804	37.3	38.1	30.0			35.8	33.2	36.2	34.0	S.E.	2	S.E.	2½			.23		8 cu-st	10 cu-st	2										28
29	29.294	41.0	29.492	42.3	48.0	35.0			41.8	40.3	41.6	38.4	S.W.	2	S.W.	2			.01		10 st	5 cu	8										29
30	29.366	42.8	29.354	42.4	46.2	36.8			42.3	40.0	40.7	39.2	S.W.	2	S.	1			.01		8 cu-st	9 cu-st	4										30
31	29.340	41.8	29.368	43.0	47.0	38.4			40.8	39.8	42.0	40.0	S.W.	1	S.	1			0		10 st	4 cu	6										31
Sums.	26 15 6 13 925.522	0 13 13 12.459	26 15 15 10 925.742	3 15 10 12.74.8	5 14 9 1298	5 10 13 10 1039.5			24 16 13 1175.7	17 15 11 1101.7	24 14 11 1170.5	17 14 11 1103.0		2 44.5		2 45.5			2.21		245		177	111										
Means.	29.856	40.2	29.863	41.1	41.9	33.5			37.9	35.5	37.8	35.6		1.53		1.47					7.9	6.8	5.7										
† Total Corrections for Instrumental Errors.	+0.006	−0.7	+0.006	−0.7	−0.3	+0.1			−0.1	−0.1	−0.1	−0.1																						
‡ Corrections for Diurnal Range.	~~0.862~~																																	
"Corrected Means."	29.862	39.5	29.869	40.4	41.6	33.6			37.8	35.4	37.7	35.5																						
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction ++ for Temp. (Col. 2), = 29.862 ..... − .031 ..... = 29.831

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ++ for Temp. (Col. 4), = 29.869 ..... − .031 ..... = 29.838

Mean at Station, corrected, and at 32°, ... = 29.834

Correction for height, 66 feet above Mean Sea-level, ... = 0.074

Mean, reduced to 32°, and Sea-level, ... = 29.908

Highest Reading, corrected for Index error, on the 7 th, ... = 30.398

Lowest Do. Do., on the 5 th, ... = 29.246

Difference, or **Monthly Range,** ..... = 1.152

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 4 th, ... = 50.9

Lowest in Month, corrected for Index errors, on the 13 th, ... = 26.8

Difference, or **Monthly Range,** ..... = 24.1

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 41.6

"Corrected **Mean**" **of all the Lowest,** (Col. 6), ... = 33.6

Difference, or **Mean Daily Range,** ..... = 8.0

** Calculated **Mean Temperature** of Month, ... = 37.6

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), ... = 37.8

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), ... = 35.4

‡‡ Computed **Temperature of Dew-Point,** ..... = 34.2

‡‡ Do. **Elastic Force of Vapour,** ..... = .182

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 2.10

‡‡ **Relative Humidity, (Saturation = 100),** ..... = 81

RAIN fell on 21 **Days; Amount in Inches,** ..... = 2.21 inches

WIND. SUMMARY. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	0	4	9	2	7	4	4	1	1.53	
P.M.	0	1	4	8	3	5	4	4	2	1.47	
Mean.	0	1	4	8	2	6	4	4	2	1.50	= 2.25

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.;" and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
‡‡ *Practically,* though not *absolutely* a *minus* correction.
‡‡ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only.*
** While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 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.*

Observations made and Return verified by _____

(*Signed*) _____

Greatest daily range = 17.6° on the 4th

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the chief objects that the Scottish Meteorological Society proposed to itself when the Society was established in 1855, was to secure perfect uniformity in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is Fortin's Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of four feet above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of uniformity of height above ground, and method in protecting the thermometers, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer. In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or $40\frac{1}{2}$°, respectively. So also $40\frac{1}{4}$°, and $40\frac{3}{4}$°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called Storm Stations, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to Barometric Gradients, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction,

$$\frac{6,\ \text{S. W.}}{2,\ \text{W.}}$$

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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4,\ \text{st.}}{2,\ \text{cu-st.}}$, will indicate that the higher regions are covered to the amount of 4-tenths with stratus Clouds; and that the sky is further obscured to the extent of 2-tenths by lower Clouds of the cumulo-stratus kind.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. 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 $3^{\text{N.W.}}_{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—5 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending; as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

3

Aberdeen
Mar. 1879

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gordon's Hospital, Aberdeen, County of Aberdeen, in Lat. 59°7′ N, Long. 2°6′ W, Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of April 1879.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.___ inches.	9 h. A.M. Attached Thermometer °	BAROMETER. 9 h. P.M. Barometer. No.___ inches.	9 h. P.M. Attached Thermometer °	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.___ °	Min. No.___ °	Exposed Black Bulbs. Max. in Sun's rays No.___ °	Min. on Grass. No.___ °	HYGROMETER. No.___ 9 h. A.M. Dry bulb. °	9 h. A.M. Wet bulb. °	9 h. P.M. Dry bulb. °	9 h. P.M. Wet bulb. °	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	CLOUDS. 9 A.M. Velocity (0—6), and Direction. Species	Amount, (0—10), and Species. Am.	8 P.M. Velocity (0—6), and Direction. Species	Amount, (0—10), and Species. Am.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No.___ 3 inches. °	12 inches. °	No.___ 22 inches. °	Temperature of WELL at depth of ___ feet. No.___ °	SEA. Temperature at 1 fathom, and Density. °	OZONE. 0—10. 9 A.M.	9 P.M.	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.
	1	29.338	42.6	29.552	44.8	48.0	37.7			42.0	40.6	42.3	40.2	S.	1	—	0			.04	ci-cu	4	—	0	7									1
	2	29.528	44.0	29.522	41.8	44.4	33.6			41.7	40.0	39.0	38.3	N.	1	—	0			.04	ci-cu	5	St	10	4									2
	3	29.510	38.2	29.510	43.2	47.4	33.0			35.8	35.1	40.7	37.2	S.E.	1	W	1			0	ci	2	ci	2	10									3
	4	29.550	43.8	29.568	43.4	52.0	34.5			42.3	39.0	48.0	45.0	E.	1	—	0			0	ci	5	St	10	8									4
	5	29.520	46.5	29.380	46.8	49.6	42.2			46.0	43.4	44.8	43.8	S.W.	2	S.	2			.06	cu	8	St	10	0									5
	6	29.272	45.0	29.116	40.2	47.0	40.8			44.1	42.4	42.7	41.4	S.	3	S.	3			.08	St	10	St	10	0									6
	7	29.162	42.8	29.178	43.4	43.9	40.0			42.0	41.4	42.0	41.1	S.	2	S.E.	2			1.15	St	10	Nim	10	0									7
	8	29.260	43.3	29.516	43.1	43.2	40.0			42.1	41.6	41.2	40.0	S.E.	3	S.E.	2			.49	St	10	St	10	0									8
	9	29.720	43.1	29.910	41.0	43.0	38.0			40.0	38.2	40.6	39.0	S.E.	1	S.E.	2			.01	St	10	St	9	0									9
	10	30.082	43.0	30.160	43.2	44.0	37.8			41.1	38.7	41.1	39.0	E.	1	N.E.	1			0	ci-cu	3	cu	8	6									10
	11	30.198	44.6	30.098	43.2	44.1	36.5			44.4	42.0	37.9	35.4	N.E.	1	N.	1			0	cu	4	—	0	10									11
	12	30.004	40.4	29.878	40.0	40.0	34.0			39.6	35.8	35.8	32.8	N.E.	2	N.E.	3			.08	cu-st	8	cu-st	5	8									12
	13	29.912	40.2	29.878	43.6	43.0	32.1			39.4	36.1	38.1	36.3	E.	2	E.	2			.10	St	10	St	10	4									13
	14	29.774	42.4	29.722	41.2	43.0	32.2			38.1	36.2	37.8	36.1	N.E.	2	N.E.	1			.16	Nim	10	St	10	0									14
	15	29.590	40.2	29.584	41.0	40.4	32.9			36.4	35.3	37.4	36.0	N.	1	N.E.	1			.04	St	10	St	10	0									15
	16	29.516	41.4	29.588	43.2	43.0	32.1			39.6	37.7	39.9	36.5	S.E.	2	—	0			0	ci-cu	8	—	0	10									16
	17	29.618	43.4	29.808	41.2	42.2	32.0			39.7	36.8	37.8	36.2	N.	2	N.	1			.06	cu	2	cu	4	8									17
	18	29.918	43.7	29.928	41.8	42.4	32.9			40.0	38.0	38.7	37.4	N.E.	1	N.	1			0	cu	2	—	0	12									18
	19	29.822	44.0	29.710	41.0	43.5	30.2			40.4	38.0	38.0	36.2	S.E.	2	S.	1			.0	ci-cu	3	St	1	13									19
	20	29.608	46.0	29.564	44.0	43.0	33.8			40.6	37.6	39.9	36.7	E.	2	E.	1			.01	cu	2	—	0	13									20
	21	29.568	44.0	29.612	44.6	45.2	36.2			43.0	40.6	41.2	39.1	N.E.	2	N.E.	2			0	cu-st	10	St	10	0									21
	22	29.586	41.3	29.572	43.0	44.8	37.0			39.9	37.8	41.6	39.8	E.	1	—	0			.03	St	10	St	10	2									22
	23	29.536	42.8	29.644	41.7	41.0	37.3			40.6	39.3	38.8	38.0	E.	2	E.	1			.28	St	10	St	10	0									23
	24	29.862	41.4	30.062	41.2	43.8	36.9			39.4	37.8	40.1	38.2	E.	1	E.	1			0	St	10	cu-st	8	3									24
	25	29.946	41.8	29.592	41.6	45.6	37.1			42.0	40.2	40.8	41.7	S.	2	S.	1			.17	St	10	St	10	0									25
	26	29.560	44.2	29.674	43.0	47.0	41.0			44.9	43.8	42.1	41.4	S.	1	S.E.	1			.12	St	10	St	10	0									26
	27	29.830	44.0	29.986	44.0	43.9	39.6			41.7	40.8	40.9	39.8	E.	2	N.E.	1			.32	Nim	10	Nim	10	0									27
	28	30.150	44.8	30.248	44.6	45.1	38.5			43.2	41.2	42.1	39.8	N.E.	1	N.E.	½			0	St	10	cu-st	10	6									28
	29	30.256	44.0	30.260	44.0	45.7	38.6			42.2	39.0	42.1	38.8	N.	2	—	0			0	cu-st	10	cu-st	10	4									29
	30	30.222	44.1	30.218	42.8	45.0	36.8			42.1	38.7	40.3	38.8	N.	1	N.E.	½			.02	cu	7	ci-cu	9	6									30
	31																																	31
Sums.		891.418	1291.0	892.038	1281.6	1334.2	1085.3			1234.3	1173.1	1213.7	1170.0		48		33			3.26		223		216	134									
Means.		29.714	43.0	29.735	42.7	44.5	36.2			41.1	39.1	40.5	38.7		1.60		1.10					7.4	7.3	7.2										
† Total Corrections for Instrumental Errors.		+0.006	−.7	+0.006	−.7	−.3	+.1			−.2	−.3	−.2	−.3																					
‡ Corrections for Diurnal Range.																																		
"Corrected Means."		29.720	42.3	29.741	42.0	44.2	36.3			40.9	38.8	40.3	38.4																					
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction †† for Temp. (Col. 2), = 29.720 — .037 = 29.683

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.741 — .036 = 29.705

Mean at Station, corrected, and at 32°, = 29.694

Correction for height, 66 feet above Mean Sea-level, = + 0.074

Mean, reduced to 32°, and Sea-level, = 29.768

Highest Reading, corrected for Index error, on the 29 th, = 30.266

Lowest Do. Do., on the 6 th, = 29.122

Difference, or **Monthly Range,** = 1.144

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

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 4 th, = 51.5

Lowest in Month, corrected for Index errors, on the 19 th, = 30.3

Difference, or **Monthly Range,** = 21.2

"Corrected **Mean" of all the Highest,** (Col. 5), = 44.2

"Corrected **Mean" of all the Lowest,** (Col. 6), = 36.3

Difference, or **Mean Daily Range,** = 7.9

** Calculated **Mean Temperature** of Month, = 40.3

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 40.62

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 38.6

‡‡ Computed **Temperature of Dew-Point,** = 36.1

‡‡ Do. **Elastic Force of Vapour,** = .212

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 2.46

‡‡ **Relative Humidity, (Saturation = 100),** = 85

RAIN fell on 19 **Days; Amount in Inches,** 3.26 = 3.26

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	5	6	8	4	6	1	0	0	0	1.60	
P.M.	3	8	4	4	4	0	1	0	6	1.10	
Mean.	4	7	6	4	5	0	1	0	3	1.35 =	1.82

Observations made and Return verified by James Dale, Teacher, Gordon's Hospital, Abdn

(Signed) James Dale

Greatest Daily Range = 17.5 on the 4th

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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.

The Council recommend that Observations be made precisely at 9 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Hour of Observation.

Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

Barometer.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

Protection and Position of Thermometers.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Self-Registering Thermometers.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Black-Bulb Thermometers.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Dry and Wet Bulb Hygrometer.

In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are readily affected by heat from the person of the Observer.

Reading of the Thermometer.

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.

Hour of observing Temperature.

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, 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.

Verification of Thermometers.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

Ind.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

1. As regards Direction.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

2. As regards Velocity and Pressure.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Rain Gauges.

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.

Snow-falls.

Convenient abbreviations for the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, and so on.

Clouds.

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:—Thus, in the column Velocity and Direction, 6, S. W.

———— will indicate that the upper strata of Clouds travel with 2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second 4, st.

Cloud column, an entry of———, will indicate that the higher 2, cu-st.

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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

The approximate number of Hours in which objects in the sun's rays cast shadows, should be entered in the proper column.

Sunshine.

As the germination and growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

Underground Thermometers.

A knowledge of the Temperature of the Sea is not only in itself, but in its relations to that of our island, a most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of the Sea.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Temperature of Wells.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc.

Ozone.

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$^{N.W.}$, 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—5 is 4, or blowing fresh.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Atmospheric Electricity.

The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Borealeæ, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending; as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

Remarks.

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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the "Eriddia Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

Observations in connection with the Eriddia Return of the Seasons.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

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

FRUITS.	First in Blossom.
Apple,	
Black Currant,	
Cherry,	
Gean,	
Gooseberry,	
Peach,	
Pear,	
Plum,	
Strawberry,	

CROPS, mundoning Variety.	First in Blossom.	Fruit Ripe, generally.
Barley,		
Bere or Bigg,		
Oats,		
Wheat,		
Beans,		
Pease,		
Potatoes,		
Turnips,		
Rye Grass,		

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swift,		
Rail or Corn Crake,		

Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.

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 Gordons Hospital, Aberdeen, County of Aberdeen, in Lat. 57° 7' N, Long. 2° 6' W., Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of May 1879.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.___	BAROMETER. 9 h. A.M. Attached Thermometer	BAROMETER. 9 h. P.M. Barometer. No.___	BAROMETER. 9 h. P.M. Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.___	Min. No.___	Exposed Black Bulbs. Max. in Sun's rays No.___	Exposed Black Bulbs. Min. on Grass. No.___	HYGROMETER. No.___ 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	9 P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No.___ 3 inches.	12 inches.	No.___ 22 inches.	Temperature of WELL at depth of ___ feet. No.___	SEA. Temperature at Edinburgh, and Density,	OZONE. ..... 0—10. 9 A.M.	9 P.M.	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.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°								Shee	Am	Shee	Am		°	°	°	°	°					
1	30.252	44.5	30.332	43.2	45.0	34.0			40.8	38.1	41.1	38.3	N.E.	1	N.E.	1			0	Ci-cu	6	m	0	14										1
2	30.378	45.3	30.394	45.0	48.0	32.0			41.3	38.4	43.2	39.8	E.	1	m	0			0	Ci	2	m	0	14										2
3	30.410	49.9	30.396	47.2	51.3	34.7			46.9	43.0	45.9	41.2	S.E.	1	S.E.	1			0	Ci	2	m	0	14										3
4	30.454	54.1	30.458	51.2	55.4	36.9			50.1	44.1	50.1	45.9	S.	1	m	0			0	m	0	Ci	2	14										4
5	30.364	56.8	30.036	52.6	61.6	46.3			56.6	49.8	50.4	46.1	S.	1	W.	2			.15	Ci-St	3	St	10	8										5
6	30.120	47.1	30.152	41.4	43.0	33.7			38.8	37.1	36.2	33.8	N.E.	3	N.	3			.14	Nim	10	Nim	6	4									Hail and snow frequently	6
7	30.136	44.0	30.098	43.7	42.5	32.8			36.2	35.0	38.0	36.0	N.	2	m	0			.05	St	10	St	10	2									Snow and sleet	7
8	29.740	42.0	29.642	46.0	52.1	32.6			41.8	39.8	40.0	38.0	W.	2	N.	1			.10	Ci-cu	8	St	10	4										8
9	29.786	44.8	29.856	43.1	42.0	33.7			37.0	33.8	38.7	35.5	N.	3	N.	2			.02	Cu	5	St	1	4										9
10	29.898	46.7	29.812	43.2	46.3	34.0			42.1	36.8	41.8	39.0	N.W.	2	S.W.	2			.01	Cu	6	Sc	10	12										10
11	29.682	44.6	29.828	48.2	53.8	37.9			43.0	42.0	49.0	45.4	S.W.	2	N.	1			.06	St	10	Cu-St	8	6										11
12	29.948	50.0	30.036	50.1	56.6	41.0			50.1	43.4	48.8	45.0	N.W.	2	m	0			0	Ci	4	Ci	5	14										12
13	29.982	48.9	29.908	47.0	53.0	39.0			48.7	44.8	46.1	44.8	S.W.	½	S.	1			.07	Cu-St	10	Cu-St	10	6										13
14	29.910	49.0	30.002	47.4	49.5	39.0			47.8	45.2	44.8	42.2	E.	1	N.	1			0	St	10	Cu	6	8										14
15	30.110	48.1	30.224	48.2	48.0	41.8			46.4	43.8	45.2	42.8	N.	2½	N.E.	1			0	Cu-St	10	Cu-St	9	4										15
16	30.146	46.1	30.042	48.2	51.0	40.8			45.0	42.8	47.1	43.2	S.	1	S.	2			0	Ci-Cu	2	St	10	6										16
17	29.964	46.1	29.882	48.2	52.1	41.2			50.6	47.8	42.0	40.3	S.	2	S.	1			0	St	10	St	10	4										17
18	29.832	49.0	29.850	42.0	47.0	40.0			43.0	41.2	42.2	40.6	S.	1	m	0			0	St	10	St	10	0										18
19	29.844	42.8	29.816	43.6	47.0	39.5			42.4	39.9	43.0	41.2	S.W.	1	S.	1			0	St	10	St	10	0										19
20	29.828	42.6	30.012	44.0	52.7	41.3			49.1	47.1	47.8	46.3	S.	2	S.	1			.21	Ci	5	St	10	6										20
21	30.088	48.2	30.004	49.0	51.0	44.8			46.0	45.1	46.5	45.8	N.W.	1	W.	½			.02	St	10	St	10	0									Dense fog in evening	21
22	29.942	48.0	29.990	46.4	52.0	43.8			49.0	47.1	45.8	44.2	S.W.	1	N.W.	1			.40	St	10	St	10	0										22
23	30.118	49.3	30.090	48.0	54.0	42.0			50.1	45.2	48.0	45.0	N.	1½	S.	1			.19	Cu	5	Ci-St	5	12										23
24	29.880	50.0	29.788	48.6	56.4	47.0			50.3	49.0	51.0	47.0	S.W.	1	S.W.	1			.08	Nim	10	Ci	6	0										24
25	29.704	51.6	29.610	49.0	52.0	41.6			50.6	45.2	47.9	44.8	S.W.	2	S.W.	1			.03	Cu	5	Ci-St	3	12										25
26	29.498	47.3	29.478	42.0	51.0	41.8			44.7	42.8	46.4	45.0	S.W.	2	S.E.	1			.20	Nim	10	St	10	4										26
27	29.642	49.2	29.784	49.6	52.0	42.8			48.7	45.0	47.8	45.4	N.W.	½	m	0			0	St	10	m	0	8										27
28	29.790	49.8	29.680	50.8	52.0	42.8			49.5	46.0	48.8	46.4	N.	2	N.E.	2			0	Cu-St	10	Cu-St	10	0										28
29	29.728	51.0	29.648	50.4	52.0	46.4			50.1	48.3	49.0	48.0	N.E.	1	N.	1			.62	St	10	Nim	10	0									Very heavy rain	29
30	29.662	51.8	29.630	50.6	50.3	46.6			51.9	50.3	47.9	46.3	N.	1	N.	1			.46	St	10	St	10	0										30
31	29.612	50.9	29.576	49.0	49.5	44.0			48.1	44.0	45.0	42.0	N.E.	1	N.	½			.11	Ci-St	10	m	0	8										31
Sums.	29 18 15 12 928.450	24 16 11 148.5	28 14 14 12 927.994	21 15 7 145.9	2 6 1578.1	30 12 12 8			19 15 11 1436.7	10 17 10 9 1348.5	16 16 11 1404.5	8 15 9 1324.7				46.0 2		31.0 1		2.92 6		23.3		21.1	18.8 10										
Means.	29.950	48.9	29.935	47.0	50.9	39.7			46.3	43.3	45.3	42.7				1.48		1.00				7.5		6.8									
† Total Corrections for Instrumental Errors.	+0.006	-.7	+0.006	-.7	-.5	-.1			-.2	-.3	-.2	-.3											7.2										
‡ Corrections for Diurnal Range.																																	
"Corrected Means."	29.956	48.3	29.944	46.3	50.4	39.6			46.1	43.0	45.1	42.4																					
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction ‡‡ for Temp. (Col. 2), = 29.956 ..... − .050 ... = 29.906

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ‡‡ for Temp. (Col. 4), = 29.941 ..... − .047 ... = 29.894

Mean at Station, corrected, and at 32°, ... = 29.900

Correction for height, 66 feet above Mean Sea-level, ... = 0.073

Mean, reduced to 32°, and Sea-level, ... = 29.973

Highest Reading, corrected for Index error, on the 4 th, ... = 30.464

Lowest Do. Do., on the 26 th, ... = 29.484

Difference, or **Monthly Range**, ... = 0.980

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month**, (corrected for Index Errors), on the 5 th, ... = 60.8

Lowest in Month, corrected for Index errors, on the 2nd ..... = 32.1

Difference, or **Monthly Range**, ... = 28.7

"Corrected **Mean**" **of all the Highest**, (Col. 5), ... = 50.4

"Corrected **Mean**" **of all the Lowest**, (Col. 6), ... = 39.6

Difference, or **Mean Daily Range**, ... = 10.8

** Calculated **Mean Temperature** of Month, ... = 45.0

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb**, (Cols. 9 and 11), ... = 45.6

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb**, (Cols. 10 and 12), ... = 42.7

‡‡ Computed **Temperature of Dew-Point**, ... = 39.4

‡‡ Do. **Elastic Force of Vapour**, ... = .242

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

‡‡ **Relative Humidity**, (**Saturation** = 100), ... = 79

RAIN fell on 18 **Days; Amount in Inches**, ... = 2.92

WIND. Direction.	SUMMARY. N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	6	4	2	1	6	7	1	4	0	1.48	
P.M.	8	3	0	2	6	3	2	1	6	1.00	
Mean.	7	4	1	1	6	5	2	2	3	1.24	= 154

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.;" and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
‡‡ *Practically*, though not *absolutely a minus* correction.
‡‡ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only*.
** While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 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.*

Observations made and Return verified by { James Dale, Teacher, Rob. Gordon's Hospital - Aberdeen

(*Signed*) James Dale M.A.

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer.

In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction,

6, S. W.
———

will indicate that the upper strata of Clouds travel with

2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second

4, st.

Cloud column, an entry of———; will indicate that the higher

2, cu-st.

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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc.

Ozone.

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 N.W., 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—5 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

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

FRUITS.	First in Blossom.	Fruit Ripe generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.
Barley,				
Bere or Bigg,				
Oats,				
Wheat,				
Beans,				
Peas,				
Potatoes,				
Turnips,				
Rye Grass,				

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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.

Aberdeen
May 1879

To

MR ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gordons Hospital, Aberdeen, County of Aberdeen, in Lat. 57°7' N., Long. 2°6' W., Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of June 1879.

The Hours of Observation are of Greenwich Time.

Days of Month	BAROMETER. 9 h. A.M. Barometer. * No.___ (inches.)	Attached Thermometer (°)	9 h. P.M. Barometer. No.___ (inches.)	Attached Thermometer (°)	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.___ (°)	Min. No.___ (°)	Exposed Black Bulbs. Max. in Sun's rays No.___ (°)	Min. on Grass. No.___ (°)	HYGROMETER. No.___ 9 h. A.M. Dry bulb. (°)	Wet bulb. (°)	9 h. P.M. Dry bulb. (°)	Wet bulb. (°)	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	9 P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches. (°)	No. 12 inches. (°)	No. 22 inches. (°)	Temperature of WELL at depth of ___ feet. No. (°)	SEA. Temperature at 1 fathom, and Density, (°)	OZONE. 0—10. 9 A.M.	9 P.M.	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
																					Spec	Cu	Spec	Cu											
1	29.442	48.8	29.412	46.5	51.6	40.2			45.0	42.8	44.9	43.2	N.	2	N.	1			.08	St	10	Nim	10	½											1
2	29.466	48.5	29.592	49.8	50.0	41.0			48.0	45.1	47.0	44.0	E.	1	N.E.	1			.02	Cu	8	St	10	6											2
3	29.578	49.8	29.560	48.8	52.0	43.2			48.6	45.2	46.8	44.2	N.E.	½	N.W.	1			.41	Cu	8	Nim	10	2											3
4	29.656	48.2	29.802	50.1	53.0	43.4			44.9	42.8	48.3	45.0	N	1½	—	0			0	Cu	8	Ci-St	10	10											4
5	29.832	50.1	29.838	49.5	54.0	44.8			49.0	45.8	47.2	45.0	S.E.	1	—	0			0	Cu-St	10	Ci-Cu	8	10											5
6	29.816	49.6	29.820	47.6	54.0	42.0			51.5	48.2	48.0	46.2	S.E.	1	S.	1½			0	Ci-Cu	5	St	10	8											6
7	29.818	48.4	29.760	48.0	52.1	46.5			49.8	48.1	48.2	46.2	S.E.	1	S.E.	½			.18	St	10	St	10	0											7
8	29.608	49.0	29.638	48.9	49.4	46.0			49.0	47.3	48.9	47.2	E.	1	E.	½			.22	Nim	10	Nim	10	0											8
9	29.724	49.3	29.852	50.3	53.0	45.0			47.9	47.0	50.0	48.7	—	0	E.	½			0	St	10	St	10	6											9
10	29.930	51.1	29.990	53.0	58.0	48.0			51.2	50.0	53.4	51.8	—	0	E.	1			.0	St	10	St	1	8											10
11	30.056	51.0	30.038	52.0	58.4	46.0			51.0	49.9	51.0	49.9	—	0	E.	1			.03	St	10	St	10	6											11
12	30.020	51.0	30.040	50.4	52.3	47.1			49.0	47.8	49.0	47.6	E.	1	N.E.	½			.03	St	10	St	10	0											12
13	30.120	48.8	30.112	49.8	55.1	45.8			48.7	46.2	50.2	48.0	E.	½	S.	1			0	St	10	Cu-St	9	0											13
14	30.026	51.8	29.932	54.4	60.1	46.3			53.9	51.6	54.6	52.3	S.	1½	S.W.	1			.07	St	10	Cu-St	6	8											14
15	29.804	54.6	29.740	53.6	59.2	50.2			56.4	55.2	53.0	50.8	S.W.	½	S.E.	1			0	St	10	Cu	10	4											15
16	29.714	52.7	29.604	53.0	54.1	49.6			51.5	50.1	51.2	50.2	E.	1	E.	1			.25	St	10	St	10	0											16
17	29.472	53.0	29.544	52.8	55.0	48.9			50.2	49.3	50.9	48.7	E.	1	E.	1			0	St	10	St	10	0											17
18	29.680	54.1	29.802	52.4	58.8	46.4			55.0	51.3	52.2	49.1	N.	1	N.E.	½			0	St	10	Cu	8	4											18
19	29.804	54.0	29.674	52.2	58.6	48.4			54.0	50.7	52.1	50.3	S.	1	S.	1			0	Ci	1	Cu-St	10	10											19
20	29.668	57.0	29.642	59.2	66.1	48.5			58.1	53.8	60.0	55.1	S.	1	S.	1			0	St	10	St	2	10											20
21	29.610	57.2	29.410	54.0	66.0	48.5			59.4	56.0	52.6	51.4	S.W.	1	S.E.	½			.74	Ci-Cu	5	St	10	6											21
22	29.420	54.8	29.644	56.9	61.6	50.1			56.0	52.3	56.1	50.4	N.	2½	N.W.	1			.01	Ci-Cu	6	Cu	6	4											22
23	29.666	59.0	29.610	55.1	60.0	46.5			55.4	51.4	55.1	52.0	N.W.	1	S.W.	1			.01	St	10	Cu-St	8	4											23
24	29.520	55.0	29.466	53.7	60.1	50.0			55.5	53.0	54.0	52.0	S.W.	1	S.E.	½			.05	St	10	St	10	3											24
25	29.460	54.3	29.490	53.2	57.0	50.0			54.2	52.0	53.5	51.8	E.	½	S.W.	1			.18	St	10	Cu-St	10	2											25
26	29.508	60.0	29.448	54.0	61.1	50.1			58.8	54.5	53.2	51.8	S.	½	S.	1			.11	Cu-St	5	St	10	12											26
27	29.544	54.2	29.438	56.1	58.0	50.1			54.3	52.7	56.2	54.2	S.	2	S.	1			.06	St	10	Cu-St	10	2											27
28	29.464	57.6	29.578	57.4	65.5	50.0			57.4	53.7	57.6	54.1	S.	2	S.W.	1			.04	Ci-Cu	5	Cu-St	6	16											28
29	29.656	57.2	29.554	57.9	63.8	50.4			57.1	53.3	57.0	53.1	S.W.	2	S.W.	½			D	Ci-Cu	7	Ci-Cu	2	16											29
30	29.672	62.1	29.790	58.6	65.0	53.8			60.4	53.5	58.0	52.0	W.	1	W.	1			.05	Cu	5	St	2	16											30
31																																				31
Sums.	890.754	1592.2	891.020	1580.2	1722.9	1406.8			1581.7	1502.6	1560.4	1486.3		32.6		14.5			2.54		253		248	173½											
Means.	29.692	53.1	29.701	53.0 52.6	57.4	46.9 47.2			52.7	50.1	52.0	49.5		1.07		0.82					8.4		8.3												
† Total Corrections for Instrumental Errors.	+0.006	-0.8	+0.006	-.8	-.5	-.1			-.2	-.4	-.2	-.4		06		06						8.4												
‡ Corrections for Diurnal Range.																																				
"Corrected Means."	29.698	52.3	29.707	51.8	56.9	47.1			52.5	49.7	51.8	49.1																								
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction †† for Temp. (Col. 2), = 29.698 ..... − .062 } = 29.636

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.707 ..... − .062 } = 29.645

Mean at Station, corrected, and at 32°, ... = 29.641

Correction for height, 66 feet above Mean Sea-level, ... = 0.072

Mean, reduced to 32°, and Sea-level, ... = 29.713

Highest Reading, corrected for Index error, on the 13 th, ... = 30.126

Lowest Do. Do., on the 21 st ..... = 29.416

Difference, or **Monthly Range,** ..... = 0.710

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 20 th, ... = 65.6

Lowest in Month, corrected for Index errors, on the 1 st ..... = 40.1

Difference, or **Monthly Range,** ..... = 25.5

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 56.9

"Corrected **Mean**" **of all the Lowest,** (Col. 6), ... = 47.1

Difference, or **Mean Daily Range,** ..... 9.8 ... = 9.8

** Calculated **Mean Temperature** of Month, ... = 52.0

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), ... = 52.2

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), ... = 49.4

‡‡ Computed **Temperature of Dew-Point,** ..... = 46.6

‡‡ Do. **Elastic Force of Vapour,** ..... = .318

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

‡‡ **Relative Humidity, (Saturation = 100),** ..... = 81

RAIN fell on 18 **Days; Amount in Inches,** ..... = 2.54

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	1	7	3	6	4	1	1	3	1.07	
P.M.	1	3	6	4	6	5	1	2	2	0.82	
Mean.	2	2	7	3	6	5	1	2	2	0.94	= 0.88

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.;" and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
†† *Practically*, though not *absolutely* a *minus* correction.
‡‡ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only*.
** While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 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.*

Observations made and Return verified by James Dale – Teacher, Robert Gordons Hospital, Aberdeen

(Signed) James Dale

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the compari on when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer.

In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or $40\frac{1}{4}°$, $40\frac{1}{2}°$, respectively. So also $40\frac{3}{4}°$, and $40\frac{3}{4}°$, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Very great care should be bestowed on the Observations of the **Wind.** Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke; etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring-glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

$\frac{\text{6}}{\text{2, W.}}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{\text{4, st.}}{\text{2, cu-st.}}$, will indicate that the higher regions are covered to the amount of 4-tenths with stratus Clouds; and that the sky is further obscured to the extent of 2-tenths by lower Clouds of the cumulo-stratus kind.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc. 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 $3^{N.W.}_{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—5 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

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

FRUITS.	First in Blossom.	Fruit Ripe, generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

CROPS, mentioning variety.	Sowing or Planting.
Barley,	
Bere or Bigg,	
Oats,	
Wheat,	
Beans,	
Pease,	
Potatoes,	
Turnips,	
Rye Grass,	

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

	Appearing above Ground.	In Ear or Flower.	First Cut or Reaped.

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 Gordon's Hospital, Aberdeen, County of Aberdeen, in Lat. 57° 9' N, Long. 2° 6' W, Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of July 1879.

The Hours of Observation are of Greenwich Time.

Days of Month	BAROMETER. 9 h. A.M. Barometer. No.	Attached Thermometer	9 h. P.M. Barometer. No.	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.	Min. on Grass. No.	HYGROMETER. No. 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No. 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches.	12 inches.	No. 22 inches.	Temperature of WELL at depth of feet. No.	SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10. 9 A.M.	9 P.M.	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
	inches.	°	inches.	°	°	°	°	°	°	°	°	°								Shee	Amn	Shee	Amn		°	°	°	°	°					
1	29.400	53.2	28.996	56.1	55.6	50.4			53.6	51.8	54.0	52.4	S.E.	2	S.	2			.45	St	10	Cu-St	8	0										1
2	28.920	54.3	29.900	53.6	60.0	49.8			55.7	52.2	54.7	49.5	S.	1	S.W.	2			.01	Nim	10	St	10	8										2
3	29.090	54.0	29.160	53.0	58.1	50.0			53.6	49.4	53.2	50.1	S.W.	2	W.	1			.11	St	10	St	10	0										3
4	29.286	58.0	29.484	56.8	60.8	49.6			59.0	52.6	55.0	51.1	W.	1	N.	½			.11	Cu-Cu	6	Nim	10	6										4
5	29.560	56.7	29.720	56.8	59.0	49.3			57.0	51.1	54.0	51.0	N.	1	N.E.	1			.24	Cu-St	10	Ci-St	6	8										5
6	29.812	57.2	29.640	53.2	61.9	48.8			56.3	51.2	52.8	50.0	N.	1	S.W.	1			.12	Cu	4	Ci-Cu	7	14										6
7	29.380	59.6	29.302	57.0	63.5	50.0			60.4	52.0	55.5	50.9	N.W.	1½	W.	1			.09	Ci-Cu	6	St	10	10										7
8	29.054	54.4	29.060	52.0	59.7	51.2			54.4	52.1	54.0	51.6	W.	2	S.	½			.05	St	10	St	10	8										8
9	29.280	57.0	29.490	56.0	57.4	51.0			56.8	53.6	53.4	51.2	E.	1	N.	2			.07	St	10	St	10	0										9
10	29.698	53.0	29.808	52.2	53.7	48.0			52.8	48.9	49.0	47.2	N.	2	N.	1½			.04	St	10	St	10	4										10
11	29.836	56.3	29.842	53.2	56.3	45.8			54.3	48.8	52.4	48.5	N.	2	N.	1			.0	Cu-St	10	Cu-St	10	0										11
12	29.782	53.4	29.740	53.4	57.9	46.8			53.8	48.9	52.5	49.4	N.	½	N.E.	½			.0	Cu	8	Cu-St	10	6										12
13	29.712	56.0	29.694	52.8	56.0	49.1			52.8	49.4	52.2	49.9	N.E.	1	E.	1½			.18	Ci	2	Nim	10	7										13
14	29.722	54.8	29.834	52.5	52.8	49.9			52.4	50.4	51.1	49.0	N.E.	1½	N.	1			.20	Nim	10	Nim	10	0										14
15	29.868	54.0	29.940	53.0	54.5	47.8			52.2	48.1	50.9	47.8	N.	1	N.E.	½			.0	Cu-St	10	Cu-St	10	0										15
16	29.930	53.0	29.920	52.2	57.5	46.8			52.8	47.8	52.2	49.4	N.E.	1	E.	½			.0	Cu-St	10	St	10	0										16
17	29.930	53.2	29.964	53.7	54.0	49.8			53.8	50.9	52.0	51.6	E.	1	S.W.	1			.01	Cu	9	St	10	5										17
18	30.030	53.9	29.996	54.9	63.0	52.0			57.8	54.9	57.6	52.9	—	0	S.	1			.0	Cu	6	St	10	4										18
19	29.868	53.4	29.658	52.8	57.3	52.8			53.1	53.8	52.8	53.5	S.W.	½	S.W.	½			.10	St	10	Cu	8	0										19
20	29.494	53.8	29.410	52.8	53.8	51.9			53.8	53.0	53.1	52.6	S.	1	E.	1			.66	Nim	10	Nim	10	0										20
21	29.560	53.1	29.610	52.9	57.0	51.2			58.8	55.6	53.4	51.9	N.	1	N.	3			.08	Cu	8	St	10	0										21
22	29.752	54.2	29.890	53.6	57.4	50.2			53.2	51.0	53.8	51.0	N.	2	N.	1½			.01	Cu	9	St	10	1										22
23	29.934	53.0	29.936	53.0	58.5	49.9			52.4	49.8	52.5	50.1	N.	1	E.	½			.02	Cu	9	St	10	4										23
24	29.848	54.0	29.920	56.4	61.9	49.1			53.8	52.2	56.4	54.9	E.	½	N.	½			.03	St	10	Cu	8	1										24
25	29.860	59.4	29.882	57.5	64.0	48.6			59.5	52.9	57.2	53.8	W.	1	—	0			.04	Cu	5	—	0	10										25
26	29.832	61.5	29.890	57.8	64.0	49.2			60.8	53.6	57.4	54.6	W.	1	S.W.	1			.0	Cu	4	Cu	8	12										26
27	29.910	58.9	29.936	53.1	61.0	52.6			58.4	52.7	52.4	51.9	N.W.	1	W.	½			.01	Cu	9	Ci	2	5										27
28	29.848	53.3	29.910	60.9	63.9	49.8			53.3	53.2	61.8	56.1	S.W.	1	—	0			.11	Nim	2	Ci	2	4										28
29	29.922	57.0	29.830	56.6	69.8	52.1			57.0	53.5	59.8	56.9	W.	1	S.W.	½			.0	St	10	St	10	6										29
30	29.830	60.0	29.982	58.0	63.4	53.9			60.6	57.1	57.0	54.1	S.W.	1	E.	½			.0	St	10	St	10	4										30
31	29.918	56.8	29.734	57.4	57.7	50.6			56.4	53.3	54.1	53.3	E.	1	E.	1			.83	Cu	9	Nim	10	0										31
Sums.	20 20 48	18 16 29	22 23 14 6	5 16 13	26 19 13 5	5 19 5	9 14 5	5 12 14	13 13 11	14 12 14				2		1		7	3.57		256		269	127										
	919.886	173.4	921.038		1722.2	1842.4	1530.0		1727.6	1609.8	1681.2	1599.7		3.5		30.0																	
Means.	29.674	55.9	29.711	55.5	59.4	50.0			55.7	51.9	54.2	51.6		1.14		0.97					8.3		8.7										
† Total Corrections for Instrumental Errors.	+0.006	−0.8	+0.006	−0.8	−0.5	−0.2			−0.2	−0.4	−0.2	−0.4											8.5										
‡ Corrections for Diurnal Range.																																	
"Corrected Means."	29.680	55.1	29.717	54.7	58.9	49.8			55.5	51.5	54.0	51.2																					
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction †† for Temp. (Col. 2), = 29.680 ..... − 0.070 } = 29.610

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.717 ..... − 0.070 } = 29.647

Mean at Station, corrected, and at 32°, ... = 29.624

Correction for height, 66 feet above Mean Sea-level, ... = 0.074

Mean, reduced to 32°, and Sea-level, ... = 29.698

Highest Reading, corrected for Index error, on the 18 th, ... = 30.036

Lowest Do. Do., on the 2nd ..... = 28.926

Difference, or **Monthly Range,** ..... = 1.110

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 29 th, ... = 69.3

Lowest in Month, corrected for Index errors, on the 11 th, ... = 45.6

Difference, or **Monthly Range,** ..... = 23.7

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 58.9

"Corrected **Mean**" **of all the Lowest,** (Col. 6), ... = 49.8

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

** Calculated **Mean Temperature** of Month, ... = 54.4

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), ... = 54.8

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), ... = 51.4

‡‡ Computed **Temperature of Dew-Point,** ..... = 48.1

‡‡ Do. **Elastic Force of Vapour,** ..... = 336

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 3.84

‡‡ **Relative Humidity, (Saturation** = 100), ... = 78

RAIN fell on 23 **Days; Amount in Inches,** ..... = 3.57

WIND. Direction.	SUMMARY. N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	9	3	4	1	2	4	5	2	1	1·14	
P.M.	8	3	6	0	3	6	3	0	2	0·97	
Mean.	8	3	5	1	2	5	4	1	2	1·06 = 1·12	

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
‡‡ *Practically*, though not *absolutely* a *minus* correction.
‡‡ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only*.
†† While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 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.*

Observations made and Return verified by { James Dale, Teacher / Robert Gordon's Hospital

(Signed) James Dale

Greatest daily Range = 17.7° on the 29th

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer.

In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40¼°, respectively. So also 40¾°, and 40⅞° more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction,

6, S.W.

——— will indicate that the upper strata of Clouds travel with

2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second

4, st.

Cloud column, an entry of———, will indicate that the higher

2, cu-st.

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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method (described by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of wells ought, when practicable, to be taken, both at the time of the Well and of the water being noted.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc.

Ozone.

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^{NW}, 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—5 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general 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 Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1874.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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 Gordon's Hospital, Aberdeen, County of Aberdeen, in Lat. 57°9' N, Long. 2°6' W., Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of August 1879.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.	Attached Thermometer	9 h. P.M. Barometer. No.	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.	Min. on Grass. No.	HYGROMETER. No. —— 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No. —— 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount (0—10), and Species.	—— P.M. Velocity (0—6), and Direction.	Amount (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches.	12 inches.	No. 22 inches.	Temperature of WELL at depth of —— feet. No. ——	SEA. Temperature at Horizon, and Density,	OZONE. 0—10. 9 A.M.	9 P.M.	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.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°								Shee	Amn		Amn		°	°	°	°	°				
1	29.580	58.2	29.852	56.8	62.5	53.2			58.0	57.3	55.2	50.8	S.W.	1	W.	1			.11	Nim	10	m	0	5										1
2	30.042	61.0	30.132	60.4	65.8	46.9			58.7	57.4	60.0	53.9	W.	1	N.W.	½			0	Cu	5	Ci-cu	2	14										2
3	30.110	57.0	30.004	56.2	61.8	48.0			56.6	54.8	56.4	53.9	N.W.	1	E.	1			.07	Ci-st	9	Cu	6	1										3
4	29.792	56.2	29.806	56.6	58.0	52.1			57.5	52.1	56.0	54.2	N.E.	1	m	0			.06	Nim	10	Cu-st	10	0										4
5	29.762	56.0	29.680	56.6	57.2	52.4			54.5	53.2	53.8	53.9	N.	1	N.	½			.81	St	10	Nim	10	0										5
6	29.520	53.2	29.460	56.9	59.2	53.0			55.1	54.2	56.0	54.4	N.	1	N.	1½			.33	Nim	10	St	10	0										6
7	29.486	56.5	29.632	53.6	62.1	50.3			56.0	53.2	53.4	50.6	N.	2	N.	1			.04	St	10	Nim	10	0										7
8	29.680	56.4	29.742	57.4	60.4	50.1			54.3	50.2	55.1	51.7	N.W.	2	N.W.	1			.0	Cu-st	7	Cu-st	10	8										8
9	29.842	56.5	29.928	57.2	58.6	50.2			54.1	49.6	51.4	49.0	N.W.	2	N.	1			.01	Cu	8	Nim	10	6										9
10	29.978	53.0	30.008	54.9	57.0	41.8			52.0	50.0	54.5	51.3	N.W.	1½	W.	1½			.0	St	10	St	10	4										10
11	29.994	61.0	29.960	58.3	64.0	48.9			55.1	53.2	55.5	53.0	S.W.	1½	S.	1			.0	St	9	Ci	6	12										11
12	29.948	57.0	29.898	57.8	63.8	53.0			59.4	57.0	57.3	54.2	S.	1	S.	1½			.0	m	0	Ci	5	14										12
13	29.824	63.0	29.812	57.6	59.2	53.5			58.1	55.7	56.3	53.1	S.	2	S.	1½			.06	St	10	St	10	1										13
14	29.960	59.5	30.084	61.0	68.7	52.4			60.3	57.0	58.8	55.2	S.	1	m	0			.0	m	0	Ci	1	14										14
15	30.010	58.6	29.812	61.0	60.9	49.0			55.0	53.0	50.6	49.7	E.	1	E.	½			.0	Ci	2	Ci	1	10										15
16	29.764	52.8	29.578	57.3	56.0	50.0			52.1	50.8	53.0	52.0	E.	½	m	0			1.02	St	10	Nim	10	0									Foggy	16
17	29.518	57.8	29.640	57.1	57.1	51.8			56.1	53.2	53.2	52.1	m	0	E.	1			.03	St	10	St	4	0										17
18	29.712	60.0	29.780	58.0	62.0	51.8			58.0	56.0	56.4	53.0	E.	1	E.	1			.06	m	0	St	8	12										18
19	29.784	57.0	29.786	57.4	60.4	57.0			57.1	56.8	56.0	52.4	S.E.	½	S.E.	1			.08	St	10	St	10	0										19
20	29.646	57.0	29.496	56.8	57.1	53.8			56.2	53.3	53.3	54.8	S.E.	1	S.E.	½			.14	St	10	St	10	0									Very foggy	20
21	29.570	60.8	29.452	57.2	67.2	52.1			58.9	56.8	56.4	53.0	S.	½	m	0			.03	[illegible]	0	m	0	10										21
22	29.336	58.2	29.390	56.6	62.1	52.2			57.6	54.2	54.3	53.0	S.W.	1	S.W.	½			.06	Ci-cu	6	Cu-st	8	8										22
23	29.632	62.0	29.726	58.2	67.0	49.6			56.4	53.2	56.0	53.2	m	0	S.W.	1			.08	Ci	1	St	8	10										23
24	29.812	62.4	29.784	58.4	66.1	48.8			61.8	53.2	53.5	52.8	W.	1	N.W.	½			.11	Ci-cu	3	St	6	12										24
25	29.404	56.2	29.292	57.0	65.0	50.8			57.8	53.7	52.6	50.8	S.W.	1½	S.W.	1			.07	St	10	St	10	6										25
26	29.220	57.0	29.462	57.0	57.0	49.6			53.2	51.4	52.4	49.8	W.	1	N.	1			.25	Ci-st	10	m	0	4										26
27	29.368	54.0	29.070	52.0	53.0	48.8			53.0	51.7	52.0	51.0	W.	1	S.W.	½			.26	St	10	m	0	0										27
28	29.146	56.8	28.924	56.8	61.9	48.9			56.0	52.6	53.0	53.0	S.W.	2	S.W.	2			.15	Ci-cu	8	Nim	10	10										28
29	29.206	57.0	29.602	56.2	67.1	49.5			57.0	52.4	52.0	49.9	N.W.	1	N.W.	1			.15	Cu-st	8	Nim	10	6										29
30	29.758	56.0	29.704	53.8	61.3	43.5			53.4	48.8	51.6	47.8	N.W.	½	N.W.	1½			.12	m	0	Cu-st	5	10										30
31	29.748	53.4	30.066	53.0	57.2	45.3			53.0	48.9	46.8	43.2	N.W.	1	m	0			.02	Cu	6	m	0	12										31
Sums.	920.152	787.5	920.482	789.1	1890.7	1555.3			1742.3	1652.9	1694.8	1623.7							4.12			212		200	189									
Means.	29.682	57.7	29.693	57.0	61.3	50.2			56.2	53.3	54.7	52.3							1.08			6.8		6.4										
† Total Corrections for Instrumental Errors.	+0.006	−.8	+0.006	−.8	−.5	−.2			−.2	−.4	−.2	−.4										6.6											
‡ Corrections for Diurnal Range.																																	
"Corrected Means."	29.688	56.9	29.699	56.2	60.8	50.0			56.0	52.9	54.5	51.9																					
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction ‡‡ for Temp. (Col. 2), = 29.688 ..... − .074 = 29.614

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ‡‡ for Temp. (Col. 4), = 29.699 ..... − .074 = 29.625

Mean at Station, corrected, and at 32°, ... = 29.620

Correction for height, 66 feet above Mean Sea-level, ... = 0.074

Mean, reduced to 32°, and Sea-level, ... = 29.694

Highest Reading, corrected for Index error, on the 2nd ..... = 30.138

Lowest Do. Do., on the 28th, ... = 28.930

Difference, or **Monthly Range,** ..... = 1.208

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

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 14 th, ... = 68.2

Lowest in Month, corrected for Index errors, on the 10 th, ... = 41.6

Difference, or **Monthly Range,** ..... = 26.6

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 60.8

"Corrected **Mean**" **of all the Lowest,** (Col. 6), ... = 50.0

Difference, or **Mean Daily Range,** ..... = 10.8

** Calculated **Mean Temperature** of Month, ... = 55.4

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), ... = 55.25

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), ... = 52.4

‡‡ Computed **Temperature of Dew-Point,** ..... = 49.7

‡‡ Do. **Elastic Force of Vapour,** ..... = .362

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 4.00

‡‡ **Relative Humidity,** (**Saturation** = 100), ... = 82

RAIN fell on 24 **Days; Amount in Inches,** ..... = 4.12

WIND. Direction.	SUMMARY. N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	1	3	2	4	5	4	7	2	1.08	
P.M.	5	0	4	2	3	5	2	5	5	0.84	
Mean.	4	0	4	2	3	5	3	6	4	1.06 = 1.12	

Observations made and Return verified by { James Dale — Teacher / Robert Gordon's Hospital, Aberdn

(Signed) James Dale

Greatest Daily Range = 18·9 on 2nd

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering it, must be brought into the plane of the back and front of the vernier, which must be carefully adjusted so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer. In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or $40\frac{1}{2}°$, respectively. So also $40\frac{1}{4}°$, and $40\frac{3}{4}°$, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6,\ S.W.}{2,\ W.}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4,\ st.}{2,\ cu\text{-}st.}$, will indicate that the higher regions are covered to the amount of 4-tenths with stratus Clouds; and that the sky is further obscured to the extent of 2-tenths by lower Clouds of the cumulo-stratus kind.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. 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 $3\frac{N.W.}{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—5 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

Aberdeen
Augt 1st 1879

3

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

ABERDEEN SP 5 79

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gordon's Hospital, Aberdeen, County of Aberdeen, in Lat. 57°7'N, Long. 2°6'W., Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of September 1879.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.___	Attached Thermometer	9 h. P.M. Barometer. No.___	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.	Min. on Grass No.	HYGROMETER. No.___ 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	___ P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches.	12 inches.	No. 22 inches.	Temperature of WELL at depth of ___ feet. No.___	SEA. Temperature at 1 fathom, and Density,	OZONE. ..... 0—10. 9 A.M.	9 P.M.	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.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°									Spec						°	°	°	°	°					
1	30.220	56.6	30.168	57.0	62.4	40.2			54.2	48.8	54.6	51.0	S.W.	½	S.W.	1½				.17	ci	2	St	10	10											1
2	29.836	53.4	29.832	57.0	64.6	50.1			54.6	51.1	58.4	53.6	S.W.	2½	S.	2				0	St	10	St	10	4											2
3	29.758	59.0	29.808	58.8	65.0	49.1			59.1	56.3	57.6	48.6	S.W.	1½	W.	½				0	Cu-St	10	Ci-St	5	12											3
4	30.024	57.2	30.104	57.4	65.8	45.8			53.2	47.8	53.4	49.8	N.W.	1½	—	0				0	—	0	Ci-St	5	14											4
5	30.098	53.0	29.952	54.6	59.8	41.8			52.2	48.0	53.4	51.6	N.E.	½	S.E.	1				.20	Cu-St	8	St	10	9											5
6	29.772	54.8	29.660	53.6	56.1	51.5			54.0	52.8	54.3	53.4	S	1	S.	1				.01	St	10	St	10	0											6
7	29.562	54.0	29.388	53.8	56.0	52.0			53.8	53.0	54.8	54.0	S	1	S.	1½				.11	St	10	St	10	0											7
8	29.420	57.2	29.402	56.0	59.0	50.1			56.2	52.3	54.2	52.2	S	2½	S.	1½				0	Cu	5	Ci-Cu	5	12											8
9	29.380	53.2	29.622	53.2	58.0	49.6			53.0	53.0	51.0	49.2	—	0	N.	1				0	St	10	—	0	4											9
10	29.808	56.4	29.808	57.0	60.9	49.0			53.0	47.9	53.0	50.2	N.W.	1½	N.W.	½				.04	Ci-Cu	2	Ci-St	4	8											10
11	29.636	54.8	29.468	57.0	59.0	50.2			54.0	51.8	55.0	53.6	S.W.	1½	S.W.	1				.81	St	10	Nim	10	0											11
12	29.350	54.8	29.316	54.0	59.0	48.6			53.0	50.0	52.0	49.8	W.	1½	S.	1				0	Cu	8	St	2	6											12
13	29.560	57.4	29.680	56.3	63.4	45.1			55.4	49.8	53.8	50.0	S.W.	1	—	0				0	Ci-St	2	—	0	8											13
14	29.694	56.4	29.770	56.8	64.1	40.8			53.2	48.2	55.0	51.8	N.W.	1	N.W.	1				0	—	0	Ci	1	12											14
15	29.878	53.2	29.992	57.8	64.0	42.4			51.2	48.6	54.4	50.8	W.	½	—	0				0	Ci-Cu	6	St	10	10											15
16	30.066	56.0	30.042	55.0	58.6	51.0			53.0	52.8	54.0	52.4	—	0	S.W.	½				0	St	10	St	10	2											16
17	29.980	55.0	29.990	55.4	59.0	51.4			54.0	51.8	53.8	50.8	S.W.	½	S.W.	½				0	St	10	St	10	3											17
18	29.980	55.0	30.016	56.8	61.0	51.2			54.9	52.6	53.6	52.1	S.W.	1	—	0				0	Ci-St	9	Cu-Cu	6	8											18
19	30.140	52.0	30.050	57.2	57.5	48.9			53.6	50.0	52.4	50.3	N	1	S.W.	1½				.07	Ci-Cu	6	Cu	9	1											19
20	29.754	53.4	29.654	55.2	60.1	45.0			52.0	49.1	53.0	49.6	S.W.	1½	S.W.	1½				0	Ci-St	2	Ci-St	6	8											20
21	29.768	55.0	29.612	55.1	59.8	45.8			51.8	45.9	51.0	48.9	W.	1	W.	1				.04	Ci	2	Nim	10	10											21
22	29.598	54.4	29.556	54.4	56.2	47.0			51.6	48.2	48.2	44.4	N.W.	1	N.W.	1				.17	Ci-Cu	8	Ci	2	4											22
23	29.004	52.8	29.236	52.6	58.4	43.2			53.8	48.8	44.6	41.1	S.	3	S.W.	2				0	Ci-Cu	4	—	0	6											23
24	29.390	52.2	29.568	52.0	61.0	37.3			48.1	45.2	47.2	43.0	W.	1	—	0				0	—	0	Ci-St	2	12											24
25	29.740	51.0	29.882	50.6	56.0	37.8			45.6	41.2	46.0	45.6	W.	1	W	1				0	—	0	—	0	10											25
26	29.944	55.2	30.182	50.4	60.7	44.1			52.6	48.8	44.9	42.4	W.	1	W	½				0	Cu	4	—	0	11											26
27	30.186	51.4	29.912	54.6	53.0	35.6			49.4	45.2	53.0	51.2	W	1	W	1½				.24	—	0	St	10	8											27
28	29.720	55.0	29.840	52.2	59.8	43.9			54.2	53.4	45.1	43.2	S.W.	1	N.W.	½				.26	St	10	—	0	1											28
29	29.940	50.2	30.104	~~52.2~~ 51.2	60.0	37.8			47.2	44.0	47.2	43.8	W.	1	W.	1				.0	—	0	—	0	11											29
30	30.138	50.8	29.948	53.0	55.8	36.4			47.8	45.6	52.2	49.9	W.	½	S	2				1.15	Ci	1	Cu-St	10	8											30
31																																							31
Sums.	23 16 16 9 / 893.338	11 4 14 8 / 1642.8	23 16 14 11 / 893.604	15 15 16 5 / 1654.0	29 16 9 / 1796.0	16 13 11 / 1362.7			8 13 9 / 1587.7	18 15 13 / 1486.0	6 13 9 / 1560.1	28 12 14 / 1473.3		6 / 33.5		6 / 28.0				3.27 5		159	1	167	212 10											
Means.	29.779	54.7	29.787	55.1	59.9	45.4			52.9	49.4	52.0	49.4		1.12		0.93						5.3		5.6											
† Total Corrections for Instrumental Errors.	+0.006	−0.8	+0.006	−0.8	−0.5	−0.1			−0.2	−0.3	−0.2	−0.3										5.4													
‡ Corrections for Diurnal Range.																																			
"Corrected Means."	29.785	53.9	29.793	54.3	59.4	45.3			52.7	49.4	51.8	49.4																							
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction†† for Temp. (Col. 2), = 29.785 ..... − .067 ... } = 29.718

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction†† for Temp. (Col. 4), = 29.793 ... − .067 ... } = 29.726

Mean at Station, corrected, and at 32°, ... = 29.722

Correction for height, 66 feet above Mean Sea-level, ... = .074

Mean, reduced to 32°, and Sea-level, ... = 29.796

Highest Reading, corrected for Index error, on the 1st ..... = 30.226

Lowest Do. Do., on the 23rd ..... = 29.004

Difference, or **Monthly Range,** ..... = 1.222

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

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month**, (corrected for Index Errors), on the 4th ..... = 65.3

Lowest in Month, corrected for Index errors, on the 27th, ... = 35.5

Difference, or **Monthly Range,** ..... = 29.78

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 59.4

"Corrected **Mean**" **of all the Lowest,** (Col. 6), ... = 45.3

Difference, or **Mean Daily Range,** ..... = 14.1

** Calculated **Mean Temperature** of Month, ... = 52.4

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), ... = 52.25

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), ... = 49.15

‡‡ Computed **Temperature of Dew-Point,** ..... = 45.19

‡‡ Do. **Elastic Force of Vapour,** ..... = .310

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 3.47

‡‡ **Relative Humidity, (Saturation = 100),** ..... = 80

RAIN fell on 12 **Days; Amount in Inches,** ..... = 3.27

WIND. Direction.	SUMMARY. N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	1	0	0	4	9	9	4	2	1.12	
P.M.	1	0	0	1	6	7	6	4	5	0.93	
Mean.	1	0	0	0	5	8	8	4	4	1.02	= 1.04

Observations made and Return verified by James Dale, Teacher, Gordon's Hospital, Aberdeen

(Signed) James Dale

Greatest daily range = 23.7° on the 24th.

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer.

In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Very great care should be bestowed on the Observations of the

Wind.

Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the

1. As regards Direction.

mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

The Council would recommend the Hemispherical-Cup Anemometer.—a self-registering instrument which shows the

2. As regards Velocity and Pressure.

amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauge.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring-rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

——— will indicate that the upper strata of Clouds travel with 2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second 4, st.

Cloud column, an entry of———, will indicate that the higher 2, cu-st.

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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th and 25th of each month. When convenient, extra Sea Observations should be taken for other and greater depths, noting always the Temperature of the Air, and the Hour of Observation. It is also very desirable that Observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc.

Ozone.

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$^{N.W.}_{1}$, 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—5 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general 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, Aurorae Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

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

FRUITS.	First in Blossom.
Apple,	
Black Currant,	
Cherry,	
Gean,	
Gooseberry,	
Peach,	
Pear,	
Plum,	
Strawberry,	

CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Reaped.
Barley,				
Bere or Bigg,				
Oats,				
Wheat,				
Beans,				
Peas,				
Potatoes,				
Turnips,				
Rye Grass,				

Fruit Ripe, generally.

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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.

Aberdeen
Sept. 1879

BOOK POST.

To

MR ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gordons Hospital, Aberdeen, County of Aberdeen, in Lat. 57°9' N., Long. 2°6' W., Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of October 1879.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER. 9 h. A.M. Barometer. No.____	Attached Thermometer	9 h. P.M. Barometer. No.____	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.____	Min. No.____	Exposed Black Bulbs. Max. in Sun's rays No.____	Min. on Grass. No.____	HYGROMETER. No.____ 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer No.____ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.____
		inches.	°	inches.	°	°	°	°	°	°	°	°	°							
	1	29.596	53.4	29.598	51.8	53.0	42.0			52.6	51.2	43.6	40.8	S.	2½	—	0			·08
	2	29.568	47.0	29.602	49.8	53.0	38.1			45.8	43.0	42.9	40.4	S.	2	S.W.	½			0
	3	29.652	50.6	29.724	51.4	56.8	38.2			48.6	44.2	46.6	42.8	S.W.	1½	W.	½			0
	4	30.010	53.0	30.126	54.2	60.1	40.8			51.8	45.2	51.2	48.0	N.W.	2	—	0			0
	5	30.212	53.6	30.268	54.5	59.8	46.4			52.4	50.3	51.6	50.8	—	0	—	0			0
	6	30.304	50.0	30.348	51.8	62.0	39.8			47.2	45.6	46.7	45.4	N.W.	½	S	0			0
	7	30.370	50.2	30.488	51.8	60.8	37.9			45.7	43.0	49.2	48.1	S.W.	½	S.W.	½			0
	8	30.526	49.8	30.464	50.0	54.7	42.9			47.1	45.8	44.3	43.8	S.	1	S.W.	1			0
	9	30.376	48.0	30.424	48.8	60.2	35.8			44.8	43.6	53.4	50.0	W.	½	N.W.	½			0
	10	30.378	53.0	30.388	53.6	63.0	34.8			52.6	49.8	51.5	48.9	N.W.	½	N.W.	½			0
	11	30.418	52.8	30.440	52.8	58.2	41.6			49.6	47.2	52.0	49.2	—	0	—	0			0
	12	30.464	52.0	30.376	52.2	58.6	45.1			49.8	45.6	47.8	45.2	N.	1½	W.	½			~~·07~~ 0
	13	30.230	48.0	30.098	54.9	59.1	38.2			46.4	43.7	53.1	48.6	W.	1	N.W.	1			·04 ~~·43~~
	14	30.130	49.6	30.234	49.0	47.8	37.0			43.4	41.2	39.1	37.6	N.	1	N.W.	1½			·03
	15	30.210	47.0	30.230	47.4	45.1	36.5			38.4	34.0	38.2	36.6	N.W.	1½	N.W.	1½			·04
	16	30.164	42.2	29.694	47.6	44.9	35.2			38.2	36.2	44.3	41.5	W.	½	S.W.	1			·04
	17	29.478	50.0	29.760	48.8	50.0	39.9			44.8	47.4	41.9	39.6	N.W.	2	N.	1			·04
	18	29.840	47.0	29.512	49.0	51.6	36.2			42.2	34.2	45.0	43.8	N.W.	1½	S.	2			·41
	19	29.022	51.0	28.940	48.4	59.8	41.1			54.0	50.0	42.9	39.8	W.	1	W.	1			·01
	20	29.022	45.0	29.492	49.0	49.4	38.4			45.0	41.4	43.0	40.0	N.W.	2	N.W.	1			·02
	21	29.688	47.0	29.828	46.0	49.8	38.4			43.4	40.2	41.0	39.0	N.W.	1½	N.W.	½			·01
	22	29.608	48.2	29.764	52.2	61.1	36.8			48.3	46.2	53.2	50.2	S.W.	½	S.W.	½			0
	23	29.742	52.6	29.706	53.6	57.6	47.4			52.6	50.0	52.0	50.0	S.W.	½	—	0			·11
	24	29.506	54.0	29.518	51.0	53.8	46.4			53.4	51.0	47.6	45.6	S.W.	½	S.W.	½			·05
	25	29.560	48.0	29.808	43.0	51.2	36.0			46.0	41.1	35.2	36.8	—	0	W.	1			0
	26	30.092	41.0	30.234	45.4	49.0	30.0			36.7	35.0	36.2	35.4	W.	½	—	0			0
	27	30.260	38.0	30.296	44.0	57.2	29.6			33.4	31.8	38.6	37.0	—	0	W.	½			0
	28	30.244	42.2	30.180	42.8	53.0	32.4			36.8	34.8	38.9	37.5	W.	1	W.	½			·03
	29	30.278	48.0	30.386	49.0	49.5	36.2			48.0	46.2	40.8	42.1	N.	½	N.	½			0
	30	30.404	46.0	30.374	45.4	48.4	36.7			43.8	41.9	44.6	41.8	—	0	N.W.	½			0
	31	30.270	42.0	30.062	47.0	51.1	34.6			38.0	35.6	45.0	41.4	N.W.	½	W.	1			·02
	Sums.	30-11 14 11 929·612	26 14 6 1501·2	30 14 9 14 11 930·412	15 14 15 1546·2 30	15 11 1684·6 13	1513 1190·4 26			18 17 13 1424·5	14 10 1341·4 10	14 14 1404·4 16	14 13 1337·7 9		28·5 9		19·5 7			1·03 h
	Means.	29·987	48·4	30·013	49·9	54·3	38·4			45·9	43·3	45·3	43·1		0·92		0·63			~~1·44~~
	† Total Corrections for Instrumental Errors.	+0.006	-·7	+0.006	-·4	-·5	0			-·2	-·3	-·2	-·3							
	‡ Corrections for Diurnal Range.																			
	"Corrected Means."	29.993	47.7	30.019	49.2	53.8	38.4			45.7	43.0	45.1	42.8							
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	9 P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches.	12 inches.	No. 22 inches.	Temperature of WELL at depth of ____ feet. No.	SEA. Temperature at 1 fathom, and Density;	OZONE. 0—10. 9 A.M.	9 P.M.	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.
Shee	Am	Shee	Am		°	°	°	°	°				
Nim	10	—	0	1									1
ci	5	—	0	8									2
—	0	—	0	11									3
ci-st	5	ci	6	11								(5) Dense fog, greater part of day	4
st	10	st	10	3									5
ci	6	—	0	11									6
ci	1	ci-st	10	6									7
cu-st	10	cu-st	10	4									8
ci-st	2	cu-st	10	9									9
st	10	—	0	7									10
ci	2	st	10	10									11
st	10	st	10	2									12
st	10	st	8	7									13
cu-st	9	st	4	4									14
cu	8	—	0	6									15
cu-st	8	—	0	4									16
Nim	8	—	0	1									17
—	0	Nim	10	9									18
ci	5	—	0	8								Beautiful bands of cirrus S. to W. 9. P.M.	19
ci	2	—	0	6									20
—	0	—	0	6									21
cu-st	6	cu-st	8	6									22
cu-st	10	cu-st	10	1									23
st	10	Nim	10	0									24
ci	2	—	0	9									25
—	0	—	0	9								Hoar Frost.	26
—	0	cu	4	9								Abundant Hoar Frost	27
ci	4	ci	1	9								Do do do	28
st	10	cu	10	0								Fine halo round moon at 9. P.M.	29
cu-st	10	cu-st	9	0									30
ci-st	2	cu	4	8									31
	175		144	185 14									
	5·6		4·6	~~8~~									
		5·1											

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0—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

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction †† for Temp. (Col. 2), = 29.993 ..... — ·052 ... } = 29·941

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 30·019 ..... — ·055 ... } = 29·964

Mean at Station, corrected, and at 32°, ... = 29·952

Correction for height, 66 feet above Mean Sea-level, ... = 0·073

Mean, reduced to 32°, and Sea-level, ... = 30·025

Highest Reading, corrected for Index error, on the 8 th, ... = 30·528

Lowest Do. Do., on the 19 th, ... = 28·946

Difference, or **Monthly Range,** ..... = 1·582

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 10 th, ... = 62·5

Lowest in Month, corrected for Index errors, on the 27 th, ... = 29·7

Difference, or **Monthly Range,** ..... = 32·8

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 53·8

"Corrected **Mean**" **of all the Lowest,** (Col. 6), ... = 38·4

Difference, or **Mean Daily Range,** ..... = 15·4

** Calculated **Mean Temperature** of Month, ... = 46·1

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), ... = 45·4

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), ... = 42·9

‡‡ Computed **Temperature of Dew-Point,** ..... = 40·0

‡‡ Do. **Elastic Force of Vapour,** ..... = ·248

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 2·84

‡‡ **Relative Humidity, (Saturation** = 100), ... = 82

RAIN fell on 14 **Days; Amount in Inches,** ..... = 1·03

WIND. Direction.	SUMMARY. N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	0	0	0	3	5	6	9	5	0.92	
P.M.	2	0	0	0	2	6	7	8	6	0.63	
Mean.	2	0	0	0	3	6	6	9	5	0.78 = 0.61	

Observations made and Return verified by { James Dale, Teacher / Robert Gordons Hospital, Aberdeen

(*Signed*) James Dale

Greatest Daily Range = 28·2 on the 10th

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the compari on when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer.

In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40¼°, respectively. So also 40¾°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Lallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

——— will indicate that the upper strata of Clouds travel with
2, W.
extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second
4, st.
Cloud column, an entry of———, will indicate that the higher
2, cu-st.
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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc. 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 3S2, 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—5 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Directed of Leaves
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

FRUITS.	First in Blossom.
Apple,	
Black Currant,	
Cherry,	
Gean,	
Gooseberry,	
Peach,	
Pear,	
Plum,	
Strawberry,	

CROPS, mentioning variety.	First in Blossom.	Fruit Ripe generally.
Barley,		
Bere or Bigg,		
Oats,		
Wheat,		
Beans,		
Pease,		
Potatoes,		
Turnips,		
Rye Grass,		

	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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.

Aberdeen
Nov 1879

BOOK POST.

To

MR ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland,
EDINBURGH.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gordon's Hospital, Aberdeen, County of Aberdeen, in Lat. 57°7' N., Long. 2°6' W., Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of November 1879.

The Hours of Observation are of Greenwich Time.

Days of Month	BAROMETER. 9 h. A.M. Barometer. * No.	Attached Thermometer	9 h. P.M. Barometer. No.	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.	Min. on Grass No.	HYGROMETER. No. —— 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No. —— 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount (0—10), and Species.	—— P.M. Velocity (0—6), and Direction.	Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches.	12 inches.	No. 22 inches.	Temperature of WELL at depth of feet. No.	SEA. Temperature at 1 Fathom, and Density,	OZONE. 0—10. 9 A.M.	9 P.M.	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
	inches.	°	inches.	°	°	°	°	°	°	°	°	°																								
1	30.104	40.6	30.174	45.9	41.8	32.6			38.4	35.0	35.8	34.2	N	1½	N	2			.16	ci-cu	4	cu	7	5												1
2	30.276	45.0	30.316	46.6	44.0	33.8			40.4	36.1	43.9	41.2	N	1½	N	2			.10	cu	4	cu	6	1												2
3	30.440	46.8	30.430	48.4	49.9	41.9			46.8	44.1	45.4	42.6	N.W.	1½	N.W.	1½			0	cu-st	10	cu-st	5	4												3
4	30.432	49.0	30.290	48.8	51.6	41.9			45.2	43.0	44.0	40.7	N.W.	1	N.W.	½			0	st	1	ci-cu	6	6												4
5	30.210	46.6	30.228	49.1	51.2	39.8			43.6	39.8	46.8	45.8	W.	1	W	½			0	—	0	cu	2	6												5
6	30.180	51.0	30.302	51.4	54.2	44.0			51.1	47.0	50.2	46.4	W.	2	W	1			.01	cu-st	10	cu-st	10	0												6
7	30.436	52.0	30.444	49.2	57.0	44.5			51.8	46.2	45.9	42.9	W.	1½	W	½			0	ci	2	—	0	8												7
8	30.410	45.0	30.184	46.0	51.3	36.0			41.2	39.8	41.6	39.8	N.W.	½	W	1			.12	ci	6	—	0	8												8
9	29.966	51.0	30.084	50.1	52.1	40.2			51.5	48.0	43.8	41.9	S.W.	2	N.W.	½			.29	st	10	st	10	0												9
10	30.108	47.0	30.030	46.4	48.8	37.6			40.1	37.9	40.7	37.8	N.W.	1	W.	1			0	—	0	cu	6	7												10
11	29.680	44.0	29.292	46.8	47.8	37.1			43.0	40.4	40.3	38.3	S.W.	2	S.W.	1			.17	cu-st	10	Nim	10	4												11
12	29.714	45.0	29.826	44.2	39.6	33.3			37.4	34.0	36.6	33.8	N.W.	3	N.W.	3			.14	—	0	Nim	10	4												12
13	30.120	44.0	30.248	43.9	40.1	33.0			35.2	34.4	35.2	34.2	N.W.	1	N.W.	1			.06	cu	9	—	0	2												13
14	30.296	38.0	30.324	41.1	41.8	31.5			33.3	29.8	34.9	31.9	N.W.	½	W.	½			0	ci	1	—	0	4												14
15	30.302	39.6	30.198	42.0	42.0	31.8			36.6	33.3	35.2	34.0	W.	1	—	0			0	—	0	—	0	8												15
16	30.104	44.0	30.020	45.1	50.0	33.2			43.5	41.4	46.6	44.9	S.W.	½	—	0			0	ci-st	5	st	6	3												16
17	29.784	52.0	29.770	52.2	58.2	44.4			53.0	49.4	50.4	45.8	S.W.	2	S.W.	2			0	sc	10	—	0	5												17
18	30.138	45.0	30.336	49.0	53.9	38.5			41.2	39.8	47.6	45.6	S.W.	½	S.W.	½			.06	ci	2	—	0	3												18
19	30.444	50.0	30.502	49.2	52.8	43.4			50.0	49.1	46.1	45.4	—	0	W.	1			.06	st	10	st	10	0												19
20	30.504	45.6	30.480	47.1	47.0	41.9			44.8	40.0	44.6	39.9	S.E.	2	S.E.	1			~~.44~~ 0	cu-st	10	cu	8	1												20
21	30.266	48.2	30.022	47.8	46.0	42.1			46.2	43.2	45.1	43.2	E.	2	E.	1			~~.56~~ .44	cu-st	10	cu-st	10	0												21
22	29.832	46.4	29.870	42.8	45.6	34.8			42.6	40.3	37.0	35.6	E.	1	—	0			.06	cu-st	10	st	10	3												22
23	29.904	45.0	30.062	44.8	44.5	35.2			39.5	38.4	39.4	37.9	N.W.	½	N.W.	½			.08	ci	1	cu	10	3												23
24	30.170	44.8	30.362	44.9	41.9	36.8			41.0	38.0	39.0	37.9	N	1	N.	½			.06	cu	8	cu	3	0												24
25	30.504	42.0	30.502	43.0	41.4	36.9			40.0	35.0	38.6	34.5	S.E.	½	S.E.	1			0	ci-cu	4	cu	10	0												25
26	30.348	44.4	30.248	44.2	40.6	33.8			35.4	32.2	40.8	38.7	N.	1	N	1			.02	st	10	cu	9	3												26
27	30.320	42.8	30.312	44.4	41.9	36.8			40.8	36.2	38.8	35.1	N.	1	N	1			0	st	10	cu	10	0												27
28	30.068	43.0	30.022	43.9	41.9	33.2			38.6	36.0	37.6	34.0	N.W.	1	N.W.	1			.11	ci	4	ci-cu	2	4												28
29	29.992	40.0	29.912	40.2	36.4	29.4			32.8	30.0	31.2	30.2	N.W.	1	N.W.	2½			.37	cu	4	cu	8	3												29
30	29.816	39.0	29.876	37.2	31.4	26.9			30.0	29.2	31.0	29.9	N.W.	1	N.W.	½			.34	st	10	ci-cu	4	2												30
31																																				31
Sums.	904.868	1356.2	904.604	1374.8	1388.7	1106.3			1255.0	1167.0	1234.1	1164.1		36.0		24.5			2.65		175		174	97												
Means.	30.162	45.2	30.153	45.8	46.2	36.9			41.8	38.9	41.1	38.8		1.20		0.98			~~.088~~		5.8		5.8	~~5.8~~												
† Total Corrections for Instrumental Errors.	+0.006	-0.7	+0.006	-0.7	-0.3	0.0			-0.2	-0.2	-0.2	-0.2										5.8														
‡ Corrections for Diurnal Range.																																				
"Corrected Means."	30.168	44.5	30.159	45.1	45.9	36.9			41.6	38.7	40.9	38.6																								
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						

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction†† for Temp. (Col. 2), = 30.168 — .043 = 30.125

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction†† for Temp. (Col. 4), = 30.159 — .044 = 30.115

Mean at Station, corrected, and at 32°, = 30.120

Correction for height, 66 feet above Mean Sea-level, = 0.074

Mean, reduced to 32°, and Sea-level, = 30.194

Highest Reading, corrected for Index error, on the 20 th, .025 = 30.510

Lowest Do. Do., on the 11 th, = 29.292

Difference, or **Monthly Range,** = 1.218

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 17 th, = 57.7

Lowest in Month, corrected for Index errors, on the 30 th, = 27.0

Difference, or **Monthly Range,** = 30.7

"Corrected **Mean" of all the Highest,** (Col. 5), = 45.9

"Corrected **Mean" of all the Lowest,** (Col. 6), = 36.9

Difference, or **Mean Daily Range,** = 9.0

** Calculated **Mean Temperature** of Month, = 41.4

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 41.2

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 38.6

‡‡ Computed **Temperature of Dew-Point,** = 35.3

‡‡ Do. **Elastic Force of Vapour,** = .206

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 2.40

‡‡ **Relative Humidity, (Saturation** = 100), = 80

RAIN fell on 18 **Days; Amount in Inches,** = 2.65

WIND. Direction.	SUMMARY. N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	5	0	2	2	0	5	4	11	1	1.20	
P.M.	5	0	1	2	0	3	7	9	3	0.98	
Mean.	5	0	2	2	0	4	5	10	2	1.09 = 1.19	

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

Observations made and Return verified by James Dale, Teacher, Gordon's Hospital, Aberdeen

(Signed) James Dale

Greatest Daily Range = 16·8 on the 16th

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero-point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the compari on when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer. In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure-Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. 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 the 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

——— will indicate that the upper strata of Clouds travel with 2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second 4, st.

Cloud column, an entry of———, will indicate that the higher 2, cu-st.

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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Inverspook.

Temperature of Wells. The Temperature of the water at the bottom of ——— ought, when practicable, to be taken, both the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. 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$^{W}_{7}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—5 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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,					Peases,				
Lime,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plane,					Rye Grass,				

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 Gordon's Hospital, Aberdeen, County of Aberdeen, in Lat. 59°7' N., Long. 2°6' W., Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 66 feet, above Ground 2½ feet. During the MONTH of December 1879.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.___ (inches)	9 h. A.M. Attached Thermometer (°)	9 h. P.M. Barometer. No.___ (inches)	9 h. P.M. Attached Thermometer (°)	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No.___ (°)	Min. No.___ (°)	Exposed Black Bulbs. Max. in Sun's rays No.___ (°)	Min. on Grass. No.___ (°)	HYGROMETER. No.___ 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)
	1	29.806	36.4	29.852	32.2	35.9	26.3			31.6 ~~30.0~~	30.8 ~~29.2~~	32.9 ~~31.0~~	30.5 ~~29.9~~
	2	29.796	37.0	29.870	34.0	34.8	22.4			31.8 ~~31.6~~	30.8 ~~30.8~~	24.5 ~~32.9~~	24.1 ~~30.5~~
	3	29.794	27.0	29.726	35.6	30.8	12.1			23.0	22.2	29.1	28.8
	4	29.656	31.6	29.512	36.0	29.2	13.9			16.1	15.8	29.2	28.9
	5	29.384	33.8	29.532	36.2	35.9	22.6			29.0	29.0	31.5	31.2
	6	29.892	30.4	30.094	34.0	32.8	24.4			27.6	27.0	26.2	26.0
	7	30.270	34.0	30.370	26.2	37.0	23.1			30.2	29.4	30.9	29.5
	8	30.408	29.8	30.348	36.5	36.1	21.2			25.8	25.6	31.8	30.0
	9	30.182	38.0	30.374	38.4	41.8	28.6			37.0	35.2	35.0	33.2
	10	30.422	30.0	30.420	34.9	33.2	24.4			28.8	28.0	27.5	26.6
	11	30.384	30.0	30.456	37.9	39.0	20.2			28.0	27.5	37.2	35.5
	12	30.524	37.0	30.544	38.0	37.5	29.9			37.0	33.8	32.0	30.2
	13	30.430	35.0	30.268	39.6	41.9	25.6			32.0	31.0	39.0	37.2
	14	30.086	41.0	30.078	46.7	48.6	36.4			40.5	39.2	47.9	45.0
	15	30.208	43.0	30.274	42.6	49.2	39.1			43.2	40.2	40.9	39.7
	16	30.190	42.6	30.160	43.6	45.6	37.4			41.8	39.8	42.0	40.0
	17	30.380	43.2	30.522	43.8	46.2	34.5			42.2	41.0	42.2	41.4
	18	30.540	39.0	30.532	40.1	41.0	30.8			36.1	35.0	31.1	29.2
	19	30.510	35.0	30.594	32.5	38.9	27.6			32.4	31.2	29.1	28.5
	20	30.484	40.0	30.294	40.4	40.0	25.8			37.1	36.1	39.2	37.0
	21	30.094	39.0	29.884	39.4	38.0	29.7			33.4	32.0	38.1	36.6
	22	30.096	39.4	30.168	43.5	44.0	36.1			38.0	35.0	43.1	40.6
	23	30.242	47.8	30.110	46.0	55.8	41.4			48.0	46.2	46.2	43.8
29.918	24	29 ~~30~~.918	44.0	30.048	41.4	44.0	34.8			41.5	39.1	39.2	36.0
	25	30.352	41.0	30.398	40.8	41.2	34.6			38.4	35.2	37.2	35.2
	26	30.270	38.2	30.196	38.8	39.4	31.6			37.0	34.9	35.1	34.8
	27	29.936	31.0	29.372	43.9	44.4	33.2			40.2	38.0	44.6	43.5
	28	29.534	42.2	28.746	45.7	52.3	37.9			41.8	37.6	47.2	42.2
	29	29.420	39.9	29.274	42.2	50.9	35.8			38.0	35.6	38.9	35.7
	30	29.194	39.6	29.148	41.3	40.2	34.0			37.7	36.5	37.2	34.1
	31	29.272	37.7	29.214	40.9	39.9	31.1			36.3	34.4	39.9	38.0
Sums.		931.674	1153.6	930.378	1213.1	1265.5	906.5			1081.5	1033.1	1125.9	1073.0
Means.		30.054 ~~30.086~~	37.2	30.012	39.1 ~~39.4~~	40.8	29.2			34.9	33.3	36.3	34.6
† Total Corrections for Instrumental Errors.		+0.006	−0.7	+0.006	−0.7	−0.3	+0.1			−0.1	−0.1	−0.1	−0.1
‡ Corrections for Diurnal Range.													
"Corrected Means."		30.060 ~~30.092~~	36.5	30.018	38.4 ~~38.8~~	40.5	29.3			34.8	33.2	36.2	34.5
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12

Days of Month.	WIND. 9 h. A.M. Direction.	9 h. A.M. Force	9 h. P.M. Direction.	9 h. P.M. Force	Readings of the H. Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	CLOUDS. 9 A.M. Velocity (0—6), and Direction. (Amount)	Amount, (0—10), and Species. (Species)	___ P.M. Velocity (0—6), and Direction. (Amount)	Amount, (0—10), and Species. (Species)	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No.___ 3 inches. (°)	12 inches. (°)	No.___ 22 inches. (°)	Temperature of WELL at depth of ___ feet. No.___ (°)	SEA. Temperature at 1 fathom, and Density. (°)	OZONE. 0—10. 9 A.M.	9 P.M.	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.
1	N.W.	1	N.W.	½			.02 ~~.34~~	10	cu-st	2	cu	2								Snow lying deep	1
2	N.W.	½	N	1			.15	10	st	—	—	0								Snow-storm still continues — Hail	2
3	N	2	N.E.	1			.01	3	ci	—	—	2									3
4	~	0	W	½			.01	2	ci	10	cu	5									4
5	W	½	W	½			.04	10	st	9	cu	1									5
6	~	0	W	1			.00	1	ci	1	ci	6									6
7	~	0	N.W.	1			.00	—	—	—	—	4									7
8	N.W.	½	W	½			.00	1	ci	—	—	4									8
9	S.W.	1	N	½			.10	10	cu-st	—	—	3									9
10	N.W.	1	N.W.	½			.00	1	ci	—	—	3									10
11	N.W.	½	~	0			.00	1	ci	10	cu	3									11
12	~	0	N.W.	½			.00	8	ci-cu	—	—	2									12
13	~	0	S.W.	½			.00	3	ci-st	—	—	2									13
14	S.W.	1	S.W.	½			.00	5	cu-st	—	—	0									14
15	W	½	W	½			.00	2	ci	—	—	4									15
16	S.W.	1½	W	2			.00	2	ci-st	4	ci-cu	2									16
17	W	½	W	1			.00	8	ci-cu	—	—	1									17
18	~	0	~	0			.00	1	ci	—	—	5									18
19	S.W.	1	S.W.	½			.00	—	—	—	—	3								Dense fog up till mid-day	19
20	S.W.	1	S.W.	1½			.00	10	st	10	cu-st	2									20
21	S.W.	1	S.W.	1½			.00	—	—	8	cu	5									21
22	W.	1	S.W.	2			.00	—	—	6	cu	3									22
23	S.E.	½	S.W.	1½			.04	6	ci-st	6	ci-cu	4									23
24	S.W.	½	S.W.	1			.00	10	ci-st	1	ci-cu	5								Lunar halo	24
25	~	0	S.W.	½			.00	5	ci-st	3	cu-st	5								Do Do	25
26	S.W.	1	S.W.	1			.06	2	ci	—	—	4									26
27	S.	2	S	4			.25	10	cu	10	Nim	0								Strong gale — from 9 P.M till 1. A.M.	27
28	S.W.	1	S.W.	6			.09	2	ci	1	ci-cu	3								Violent gale, began about 6 P.M. very strong 7 to 7.30, 9 to 9.30. quiet about 12 P.M.	28
29	W.	1	W	½			.00	—	—	9	cu	6									29
30	S.W.	½	W.	½			.18	10	cu-st	2	cu	0									30
31	S.W.	½	S.W.	½			.01	10	cu	8	cu	0									31
Sums.		21.5		33.0			.90	143		100		89									
Means.		0.69		1.06				4.6 (mean of 4.6 and 3.2 = 3.9)		3.2											
No. of Column.	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction †† for Temp. (Col. 2), = 30.060 ~~30.092~~ ..... — 0.020 = 30.040 ~~30.071~~

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 30.018 —0.027 = 29.991

Mean at Station, corrected, and at 32°, = 30.016 ~~30.031~~

Correction for height, 66 feet above Mean Sea-level, = 0.074

Mean, reduced to 32°, and Sea-level, = 30.090

Highest Reading, corrected for Index error, on the 19 th, = 30.600

Lowest Do. Do., on the 28 th, = 28.752

Difference, or **Monthly Range,** = 1.848

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 23d, = 55.5

Lowest in Month, corrected for Index errors, on the 3d, = 12.82

Difference, or **Monthly Range,** (43.3) = ~~42.5~~

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 40.5

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 29.3

Difference, or **Mean Daily Range,** = 11.2

** Calculated **Mean Temperature** of Month, = 34.9

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 35.5

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 33.8

‡‡ Computed **Temperature of Dew-Point,** = 31.2

‡‡ Do. **Elastic Force of Vapour,** = .176

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 2.05

‡‡ **Relative Humidity, (Saturation = 100),** = 81

RAIN fell on 11 **Days; Amount in Inches,** = 0.90

WIND. 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	1	1	11	5	5	7	0.69	
P.M.	2	1	0	0	1	12	9	4	2	1.06	
Mean.	2	0	0	1	1	12	7	4	4	0.88 = 0.77	

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.;" and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.
† Embracing corrections for both capillarity and Index Errors.
‡ The Diurnal Range for Scotland is as yet unknown.
†† *Practically*, though not *absolutely* a *minus* correction.
‡‡ These "Hygrometrical Deductions" are calculated from Glaisher's Hygrometrical Tables, Second Edition *only*.
** While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 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.*

Observations made and Return verified by James Dale — Teacher, Gordon's Hospital, Abdn

(Signed) James Dale

Greatest daily range = 18.8° on the 11th

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down—viz., as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for, if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principal of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for, if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, have a black coating, which may easily be made, or mended, by the application of a mixture of lampblack and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The Maximum should be freely exposed to the sun, and the Minimum should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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 Thermometer. In reading the Thermometer great care must be taken to bring 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, 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or $40\frac{1}{2}°$, respectively. So also $40\frac{1}{4}°$, and $40\frac{3}{4}°$ more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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.

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, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Negretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean 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 Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Baltingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Gauge should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may 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, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

———— will indicate that the upper strata of Clouds travel with 2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second

Cloud column, an entry of $\frac{4, \text{st.}}{2, \text{cu-st.}}$, will indicate that the higher regions are covered to the amount of 4-tenths with stratus Clouds; and that the sky is further obscured to the extent of 2-tenths by lower Clouds of the cumulo-stratus kind.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. 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 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—5 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general 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, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, 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 ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. 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 Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and improved before being used; and they consider it necessary 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, *December* 1877.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

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

FRUITS.	First in Blossom.	Fruit Ripe, generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Shred.
Barley,				
Bere or Bigg,				
Oats,				
Wheat,				
Beans,				
Peas,				
Potatoes,				
Turnips,				
Rye Grass,				

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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.