

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Achterlyne Cliff, County of Perth, in Lat  $56^{\circ} 23' 24''$  Long  $3^{\circ} 53' 1''$  Distance from Sea 4.5 miles.

Height of Cistern of the Barometer above Mean Sea-level 333 feet, above Ground 3 feet.

During the MONTH of January 1884.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS Read Daily, at 9 P.M.				HYGROMETER No. 1034				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.		OZONE.		Days of Month.
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Temperature of Well at Depth of feet, No. 0—10.		Temperature at 1 fathom and Density, 9 a.m., 9 p.m.		Days of Month.		
		Barometer. No. 211 inches.	Attached Thermometer. No. 211 inches.	Barometer. No. 1036 inches.	Attached Thermometer. No. 1036 inches.	Max. No. 1036 No. 1036	Min. No. 1036 No. 1036	Max. in Sun's rays No. 1036 No. 1036	Min. on Grass. No. 1036 No. 1036	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	9 h. A.M.	9 h. P.M.	Readings of the H.Cpt Anemometer No. 6231	No. of hours in which it fell	Velocity (Col. 9) and Direction. N.C.—	Velocity (Col. 10) and Direction. N.C.—	Amount (0—6) and Species.	Amount (0—6) and Species.	9 h. A.M.	9 h. P.M.	Amount (0—10) and Species.	Amount (0—10) and Species.	Hours.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of Well at Depth of feet, No. 0—10.	Temperature at 1 fathom and Density, 9 a.m., 9 p.m.	As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.
	1	30.124	41	29.950	41	39.34	48	19	33	32.0	30	2.0	6.2	2	0.008	3	9	5	10	0	35	38	40.5	0.002	0	0	0	0	1			
	2	29.754	40	29.672	40	38	31	39	28	33	32.3	2	0	6.0	0.080	0	10	0	10	0	35	38	40	0.002	0	0	0	0	2			
	3	29.608	37	29.708	38	38	22	34	19	28	26.8	3	0	6.0	0.000	0	10	0	10	0	34.5	37.5	39.5	0.000	0	0	0	0	3			
	4	29.752	40	29.726	40	40	27	41	37	38	37.1	4	0	6.0	0.000	4	10	0	10	0	35.5	37.5	39.5	0.000	0	0	0	0	4			
	5	29.394	43	29.378	46	46	36	18	31	46	45.2	5	1	SW	2	1.01	6	10	6	10	0	40	38	39	0.001	0	0	0	0	5		
	6	28.972	46	29.198	46	49	42	51	38	48	44.8	6	2	W	2	0.59	4	8	3	8	1/4	42	42	40	0.001	0	0	0	0	6		
	7	29.364	46	29.586	44	48	38	50	28	41	38.2	7	0	W	1.5	0.01	3	6	2	5	3/4	40	41	40	0.000	0	0	0	0	7		
	8	29.454	44	29.572	48	49	34	69	36	41	40.1	8	0	W	0	—	2	9	2	9	1	39.5	40	40.5	0.000	0	0	0	0	8		
	9	29.424	48	29.648	46	51	39	69	35	49	48.2	9	2.5	SW	0	0.02	6	9	4	8	1/4	43.5	41	40.5	0.000	0	0	0	0	9		
	10	29.518	47	29.468	46	54	41	63	32	45	43.8	10	2.5	W	0	0.02	4	8	5	8	0	42.0	41.0	41	0.000	0	0	0	0	10		
	11	29.384	44	29.788	44	48	30	57	27	33	31.5	11	2	W	1.5	0.26	2	2	1	2	3	39.0	41.0	41	0.000	0	0	0	0	11		
	12	29.936	44	29.772	45	41	31	67	25	40	36.8	12	0	W	1	0.03	1	4	2	8	3	38	40	41	0.000	0	0	0	0	12		
	13	29.944	45	29.834	45	48	38	80	28	43	41.3	13	0	W	0	—	2	4	2	8	1/4	40	40	40.5	0.000	0	0	0	0	13		
	14	29.824	47	30.016	48	51	41	66	33	49	46.7	14	0	W	2	0.04	2	5	2	2	3	42.5	40.5	41	0.000	0	0	0	0	14		
	15	30.132	47	30.802	52	54	42	82	32	45	43.4	15	1	W	1	—	2	3	2	6	1/4	41.5	41	41	0.000	0	0	0	0	15		
	16	30.300	48	30.172	49	53	40	58	30	44	41.6	16	0	W	1	—	1	4	0	0	6	42.5	42	41.5	0.000	0	0	0	0	16		
	17	30.124	47	30.088	48	53	39	85	29	42	40.2	17	1	SW	0	—	3	8	0	10	1	42	42	42	0.000	0	0	0	0	17		
	18	30.084	47	29.984	48	47	37	56	29	43	42.2	18	0	W	1.5	—	3	9	0	10	0	42.5	42.5	42	0.000	0	0	0	0	18		
	19	29.948	47	29.882	48	47	41	49	35	47	46.1	19	1	W	1	—	3	9	0	10	0	43.5	42.5	42	0.000	0	0	0	0	19		
	20	29.784	48	29.552	48	51	42	60	36	45	42.8	20	2.5	W	3	0.33	4	6	0	10	1/4	44	43	42.5	0.000	0	0	0	0	20		
	21	29.570	48	29.540	48	67	32	—	—	—	21	1	W	3	—	84	—	—	—	—	3	42	43	42.5	0.000	0	0	0	0	21		
	22	29.360	47	29.216	45	76	30	—	—	—	22	2.5	W	3	—	84	—	—	—	—	1/2	41	43	42.5	0.000	0	0	0	0	22		
	23	29.034	44	28.638	44	50																										







# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Ochtertyre Criff, County of Perth, in Lat. 56° 23'. 34", Long. 3° 53'. 1", Distance from Sea 45 miles.

Height of Cistern of the Barometer above Mean Sea-level 333 feet, above Ground 3 feet.

During the MONTH of March 1884.

The Hours of Observation are of Greenwich Time.

The Ball of Thunder at 3 P.M. No. 2

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction <sup>††</sup> for Temp. (Col. 2), = 29.478 - :040	= 29. <del>474</del>  ·436
Corrected Mean" of Barometer at 9 P.M., minus the Correction <sup>††</sup> for Temp. (Col. 4), = 29.478 - :042	= 29. <del>476</del>  ·436
Mean at Station, corrected, and at 32°,	= 29.437
Correction for height, 333 feet above Mean Sea-level, 8 Temperature,	= 0.366
Mean, reduced to 32°, and Sea-level,	= 29.803
Highest Reading, corrected for Index error, on the 24 <sup>th</sup> ,	= 29.986
Lowest Do. Do., on the 20 <sup>th</sup> , <del>24<sup>th</sup></del>	= 28.702  1.284
Difference, or Monthly Range,	=

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 16th,	=	<u>66.0</u>
Lowest in Month, corrected for Index errors, on the 4th,	=	<u>34.3</u>
Difference, or Monthly Range,	=	<u>48.7</u>
" Corrected Mean " of all the Highest, (Col. 5),	=	<u>47.0</u>
" Corrected Mean " of all the Lowest, (Col. 6),	=	<u>33.5</u>
Difference, or Mean Daily Range,	=	<u>13.5</u>
** Calculated Mean Temperature of Month,	=	<u>40.2</u>

<b>HYGROMETER, Mean</b> (corrected) A.M. and P.M. Reading of Dry Bulb, (Col. 9 and 11), .....	=	<u>59.8</u>	39.5
<b>Mean</b> (corrected) A.M. and P.M. Reading of Wet Bulb, (Col. 10 and 12), .....	=	<u>38.1</u>	38.1
## Computed Temperature of Dew-Point, .....	=	<u>36.3</u>	36.3
## Do. Elastic Force of Vapour, .....	=	<u>1219</u>	1214
## Do. Weight of Vapour in a Cubic Foot of Air, ...	=	<u>8.76</u>	8.76
## Relative Humidity, (Saturation = 100), .....	=	<u>89</u>	89
<b>RAIN</b> fell on <del>18</del> Days; Amount in Inches,	=	<u>4.91</u>	4.91

WIND.	SUMMARY.										
	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	1	12	0	0	10	3	3	2	0.65	
P.M.	0	0	11	1	0	11	4	1	3	0.55	
Mean.	0	0.5	11.5	0.5	0	11.5	3.5	2.5	2.5	0.60	$= 0.36 \text{ P.M.}$
	0	1	11	1	0	10	3	2	3		

<b>WIND.</b>	<b>SUMMARY.</b>
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A.M.	0	1	12	0	0	10	.3	.3	2	0.65	
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P.M. 0 0 11 1 0 11 41 3 0.55

$$\text{Mean. } \frac{0.054450.501153.352.02.5}{8} = 0.60 = 0.36 \text{ kgs}$$

6, 7, 8, 9, 10, 11, 12, 13

Observations made and  
Return verified by { George Groucher  
The Gardens Colsterley Cirencester

(Signed) —





# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

## WITH REMARKS ON THE USE OF INSTRUMENTS.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Larch-boarded Box for Protection and use.

Thermometers, painted white inside and outside, and served to four stout posts, also painted white, firmly fixed in the ground.—The posts must be of such a length that when Leatum from two Stations, so very considerable as to render them fit to be in position of the Bulbs of the Minimum Register. By the laws of the Society, Members and Observers have right to have their instruments compared by the Secretary, and of the hours of observation, or even from the time of different constellations. It is therefore hoped, that those who kindly furnish Reports to the Society will, by a suitable attention to the following Directions, secure for their Weather-Glasses and Altimeters, an accuracy and value commensurate with the care and pains involved in making them; and for the Fables 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. (Cranavich or Railway Time only), of the columns of the Schedule. It is hoped that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the eastern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the eastern, is entirely got rid of is Portia's. The Barometer originally constructed by M. Adie of London, and usually called the Board of Trade Barometer, has the great convenience of requiring no adjustment of the eastern. Its scales are not true inches, but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the mercury in the eastern. This is an excellent Barometer for ordinary Observers, insomuch as it entirely eliminates the error of the Standard more than 0.003 inch.

A modification of Portia's Barometer is used at a number of 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 base passes freely through the lid and ease of the eastern. When the index-line on this little piston is brought by the adjusting screw, to form one straight line with 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 western.

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 a good light as can be secured, and to facilitate the reading, a piece of white paper may be placed 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 fire. The object being brought into the plane of the back and front of the index—usually the lower edge of the vessel, 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.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the eastern-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 vessel, 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.

In 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 vessel 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 1/300 in., 0/300 in., and 0/500 in.; what is to say, instead of 29.365 inches, either 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 be removed so as to form a tight plug to the eastern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but within a quarter of an inch of it, and take off the instrument; it should then be carried with the eastern uppermost. If alone suspended, consisting of setting the edge of the vessel to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

As Barometers are liable to be damaged 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 weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any part that may be open, 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 eastern with the palm of the hand, so as to induce the air to ascend through the tube to the eastern, and escape. Since there is the

continuity of the eastern, the mercury may escape. In the event of this happening, first close up the eastern by screwing the ivory peg tight, as far as possible, to prevent the escape of mercury; then screw up the mercury to the top of the tube; and having

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replaced the instrument, place the top of it on a yielding substance such as the boot, and gently tap on the eastern with the palm of the hand, so as to induce the air to ascend through the tube to the eastern, and escape. Since there is the

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# 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 permanent meteorology in the system of observation pursued at all its Stations. Unhappily in the observations are absolutely necessary to justify its being found that different between them, Returns from two Stations, so very considerable as to render them quite incongruous, may arise from dissimilarity in the position, or 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 observations, an accuracy and value commensurate with the time at which it was taken, if not at 9 A.M. or 9 P.M.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is Forbin's Barometer; the arrangement consisting in applying pressure by means of a screw to the bottom of an piston, 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 scales are not true inches, but so much shorter as to compensate the want of a screw to hold the thermometers in place.

It is necessary to make with scrupulous care, before giving it to the comparison with a Standard Barometer, that the space above the mercury in the cistern, is exactly equal to the space of the Standard more than 0.003 inch.

A modification of Forbin'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 index line on this little piston-spool is brought by the adjusting screw, to form a straight line with those on its ivory frame, the object being to prevent heat rays from affecting the mercury scale.

To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a year, with the Barometer of Standard, Barometric particular care being given to make the comparison in as good a light as can be had, the result that none of the readings differed from those rapidly, with the result that none of the readings differed from those of the Standard.

The Barometer having adjustment surfaces has to be removed when the fastenings are taken off, the following is sometimes used instead of 29.365 inches, 29.365 inches, 29.365 inches, or 29.315 inches. Experience having shown that even the very best Observers make mistakes, particular attention is directed to the matter.

The errors most frequently made in reading the Barometer are errors of 1.000 inch, 0.500 inch, and 0.500 inch, that is to say, the mercury strikes the top of 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, consists 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.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be removed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then plug up the mercury not quite to the top of the tube, but 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 made to descend, whether the space above the mercury in the tube is a complete vacuum; this is done by roughly handling it, it may be until the pressure of the mercury in the cistern, whence it may escape. Since there is the

column to the cistern, whence it may escape. The Self-Registering Thermometer is read at 9 A.M. and 9 P.M. The Self-Registering Thermometer, great care must be taken to their proper meteorological day. In the case of the thermometer, the indications registered on the 2d are those of the thermometer, the indications registered on the 2d, and extending to the 3d.

When the Self-Registering Thermometers are read, since in winter the mercury may occur at any hour, and it is necessary to refer their occurrence to their proper meteorological day. In the case of the thermometer, the indications registered on the 2d, and extending to the 3d.

No instrument ought to be used for Meteorological purposes all thermometer ought to be tested with a thermometer, which is generally taken by a properly constructed apparatus, from boats, or if this is impracticable from the ends of poles and rocks round the dry bulb of the Hygrometer. The freezing-point of each thermometer, 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 mercury has been expelled. On having done this, the mercury will return to stand down the tube before infastening the tube, and the instrument be seriously damaged.

## WITH REMARKS ON THE USE OF INSTRUMENTS.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometers of which are not likely to stand exposure to the weather, as shown in this past repeated and annoying breakages, be kept in Stevenson's Lowney-bound Box for Thermometers, painted white inside and outside, and of similar construction; and as regards Maximum and greater depths, nothing very desirable that observations on the Hour of Observation. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed in water, and attached to points along the coast, by the method proposed by Mr. Stevenson, and already commanded at Penzance and Liverpool.

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

Mention what Test-Papers are used, Salinometer or Medita'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, and the date of observation, in the following manner:—thus 3<sup>rd</sup>, as an Ozone entry in 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 condensation of the atmosphere in connection with the force and direction of the wind, the accuracy being noted.

Mention what Test-Papers are used, Salinometer or Medita's, etc.

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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 portions of the science.

A Wind-Vane ought to be placed over a flat, above ground, and motionless, to allow of the direction of smoke, etc.

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Received at K Observatory  
On Aug. 1<sup>st</sup> 1884.

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Ochtertyre Cliff, County of Perth, in Lat. 56° 23' 24", Long. 3° 53' 1", Distance from Sea 46 miles.

Height of Cistern of the Barometer above Mean Sea-level 333 feet, above Ground 3 feet.

During the MONTH of June 1884.

The Hours of Observation are of Greenwich Time.

ELECTRICITY. Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER, No. 1034		WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.			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, begin and end.	Days of Month.								
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer.		No. of hours in which it fell.	P.M.	SUNSHINE.	SEA.	OZONE.								
	Barometer, Attatched Thermometer No. 211 inches.	Barometer, Attatched Thermometer No. 211 inches.	Max. Min. No. 1034 No. 1041	Max. Min. No. 1034 No. 1041	Max. in Sun-rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force	9 h. A.M.	Velocity (0—6) and Direction.	Amount, (0—10), and Duration.	Velocity (0—10) and Direction.	Amount, (0—10), and Duration.	Hours.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of Well at depth of feet, No. 0—10.	Temperature at 1 fathom, and Density, 9 A.M. 9 P.M.		
1	29.438 57	29.192 57	70 36	10 38	55	51.0																					1
2	29.262 57	29.434 57	60 47	72 47	58	53.0																					2
3	29.492 58	29.500 57	60 46	74 46	57	51.8																					3
4	29.572 56	29.522 55	66 38	104 40	48	46.2																					4
5	29.500 55	29.405 57	61 44	90 48	47	43.6																					5
6	29.358 55	29.366 56	59 43	83 46	52	48.0																					6
7	29.418 56	29.496 57	55 40	66 38	57	48.8																					7
8	29.508 56	29.584 55	64 42	100 42	57	45.1																					8
9	29.638 55	29.702 55	57 41	72 36	54	46.9																					9
10	29.720 56	29.712 57	58 45	72 45	55	50.5																					10
11	29.582 58	29.746 57	64 57	95 57	56	51.8																					11
12	29.924 57	29.942 60	64 43	92 38	58	50.1																					12
13	29.798 62	29.748 58	64 55	108 53	—	—																					13
14	29.990 58	30.008 58	62 43	74 38	54	—																					14
15	29.982 57	30.000 58	63 47	83 45	57	49.9																					15
16	29.932 58	29.906 59	63 43	87 34	57	51.2																					16
17	29.888 60	29.912 62	70 50	101 49	70	60.4																					17
18	29.904 61	29.930 61	73 50	106 49	57	53.3																					18
19	29.954 61	29.962 60	61 49	68 51	55	52.2																					19
20	29.964 61	29.950 61	63 47	77 50	60	54.9																					20
21	29.918 62	29.900 63	65 43	81 43	62	53.1																					21
22	29.842 62	29.792 62	72 50	110 51	58	56.2																					22
23	29.776 61	29.652 61	69 45	109 43	57	49.8																					23
24	29.488 61	29.400 61	69 49	112 48	59	55.5																					24
25	29.600 59	29.702 69	63 44	78 40	55	49.1																					25
26	29.702 61	29.768 62	65 48	110 45	60	57.0																					26
27	29.876 62	29.918 65	70 47	104 45	63	59.2																					27
28	29.952 66	29.900 68	80 49	128 44	71	64.1																					28
29	29.800 67	29.752 61	82 48	180 44	62	56.9																					29
30	29.758 66	29.820 66	79 50	109 48	61	57.9																					30
31																											31
Sums.	891.476 1781	891.864 1785	1964 1373	2193 1338	1660	1488.5																					
Means.	29.116 59.8	29.729 59.5																									
† Total Corrections for Instrumental Errors.	x013	x013	x3	-3	06	06																					
‡ Corrections for Diurnal Range.																											
"Corrected Means."					65.5 45.7	93.1 44.6																					



# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Ochtertyre Crieff, County of Perth, in Lat. 56° 23' 24", Long. 3° 53' 11", Distance from Sea 45 miles.

Height of Cistern of the Barometer above Mean Sea-level 333 feet, above Ground 3 feet.

During the MONTH of July, 1884.

The Hours of Observation are of Greenwich Time.

ELECTRICITY. Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER. No. 1034				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				GENERAL REMARKS.				
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer, No. —		No. of hours in which it fell.	Amount in inches.	Velocity (0—10), and Direc-tion.	Amount (0—10), and Direc-tion.	Velocity (0—10), and Direc-tion.	Amount (0—10), and Direc-tion.	SUNSHINE.	9 h. A.M.	9 h. P.M.	SEA.	OZONE.						
	Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. in Sun's rays	Min. in Sun's rays	No. 1034	No. 1034	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	9 h. A.M.	No. —	No. —	No. —	No. —	Hours.	No. 8 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at depth of feet, No. —	Temperature at 1 fathom and Density,	9 A.M. 9 P.M.	0—10.	Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.
No. 211	inches.	inches.	No. 211	inches.	Max.	Min.	No. 1034	No. 1034	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	9 h. A.M.	No. —	No. —	No. —	No. —	Hours.	No. 8 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at depth of feet, No. —	Temperature at 1 fathom and Density,	9 A.M. 9 P.M.	0—10.		
1	29.900	64	29.924	65	73	53	111	57	54	56.2	52	50	0	0	0	0	0.02	0	10	0	5	2½	63	62	58				1		
2	29.900	64	29.828	65	70	52	104	53	58	56.2	52	50	0	0	0	0	—	0	10	0	5	3	63	62	58				2		
3	29.764	64	29.700	66	72	52	110	48	59	57.8	52	50	0	0	SW	0	—	0	10	1	5	5	64	62	58				3		
4	29.700	65	29.604	65	74	52	111	52	59	57.8	52	50	0	0	E	0	2	10	0	10	1½	64	62	58.5				4			
5	29.647	68	29.636	65	65	52	79	55	54	56.4	52	50	0	0	0	0	0.02	0	10	0	10	½	63	62	58.5				5		
6	29.576	63	29.568	64	66	54	83	53	62	60.9	54	52	0	0	SW	0	0.75	0	10	0	5	0	63	62	59				6		
7	29.572	63	29.592	64	67	50	77	47	61	57.8	50	48	0	0.5	S E	0	0.11	0	10	1	10	0	62.5	61.5	58.5				7		
8	29.600	64	29.608	66	64	56	69	55	64	63.0	56	54	SW	0	S E	0	0.33	1	8	2	8	5	62.5	61	58.5				8		
9	29.582	66	29.534	65	73	56	111	56	61	59.9	56	54	0	0	N E	1.5	0.18	6	10	6	8	4	64	62.5	58.5				9		
10	29.400	65	29.300	63	70	57	100	56	62	60.2	56	54	SW	1.5	S E	1.5	0.44	6	10	6	10	0	63.5	62.5	59				10		
11	29.125	63	29.402	63	63	53	68	53	57	56.4	53	51	SW	0	SW	0	1.05	2	10	1	4	½	61.5	62	59				11		
12	29.400	63	29.502	63	68	48	108	46	60	57.1	48	46	SW	0	SW	0	0.24	1	5	2	6	5	61	61	59				12		
13	29.536	64	29.366	64	71	50	111	49	65	60.5	50	48	SW	0	S E	1	0.02	1	3	6	8	8	64	62	59				13		
14	29.354	64	29.346	64	70	53	95	49	58	56.1	53	51	SW	0.5	SW	2	0.08	4	8	4	7	4	63	62.5	59.5				14		
15	29.428	62	29.300	63	67	53	96	57	57	54.9	53	51	SW	1	S E	0	0.40	3	8	3	8	½	62	62	59.5				15		
16	29.076	63	29.042	62	68	54	98	55	60	58.2	54	52	SW	2.5	SW	1.5	0.49	4	5	4	8	¾	63	62	60				16		
17	29.134	62	29.400	62	64	48	92	45	59	57.7	48	45	W	2	W	1	0.07	3	8	1	3	3	61	61.5	59.5				17		
18	29.472	62	29.642	61	66	45	116	46	58	56.5	45	43	W	2	W	1	0.04	2	4	1	4	6	61	61.5	59.5				18		
19	29.782	60	29.834	59	64	44	109	45	57	48.8	44	42	W	0.5	W	0	1	3	1	4	6	61	61.5	59.5				19			
20	29.852	61	29.766	59	66	36	118	37	59	54.2	36	34	SW	0.5	SW	0	1	5	1	6	4	61	61.5	59.5				20			
21	29.608	57	29.618	60	67	47	110	50	53	57.1	51	49	SW	0	SW	0	0.06	2	10	2	10	0	61	61.5	59.5				21		
22	29.592	59	29.512	60	55	47	62	50	53	57.2	52	50	SW	0	W	0	0.07	1	10	2	7	½	59.5	60.5	59.5				22		
23	29.388	58	29.388	60	63	48	86	45	55	52.8	48	45	SW	0.5	W	0	0.03	1	10	3	8	59	60	59				23			
24	29.452	60	29.452	60	69	45	118	43	57	51.2	43	41	SW	0	SW	0	0.09	2	6	5	59	60	59				24				
25	29.																														





# 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

the Self-Registering Wet-Bulb Hygrometer, 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

...r, 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

greater depths, noting always the Temperature of the Air, and the  
of Observation. It is also very desirable that observations on the  
Maxima and Minima by Thermometers continuously immersed,  
instituted at points along the coast, by the method proposed by Mr  
Stevenson, and already commenced at Peterhead and Liverpool.  
The Temperature of the water at the bottom of Wells ought,  
when practicable, to be taken, both the depth of the  
Wells.  
Well and of the water being noted.

Mention what Test-Papers are used, Schönbain'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.

**Ozone.** 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  $3\frac{1}{4}$  NW, as an Ozone entry in the schedule will indicate that the Ozone paper is tinted as on the scale, that the wind is from the N.W., and that its force on the 0—5 is 4, or blowing fresh.

Too much importance cannot be attached to the electric condi-

and 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.

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

The Council recommend that Observations be made precisely at 9 A.M. and 9 P.M. (Greenwich or Railway Time only), and in the following Remarks on the top of each page, the observations made at different Stations are compared.

Hour of

tion of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is a truth, necessary to every complete meteorological observatory.

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 named. The use of contractions, ought, therefore, to be taken 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 Present Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the etc. Remarks ought to be made on the occurrence of Meteors, comets, remarkable demensions, alterations, and fluctuations

is, in every 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.

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 Horological Surveyor, and Mr. P. Bellinger the Surveyor of the Royal Observatory, are recommended; the

as specified in the following remarks, or at the top of the columns of the Schedule. It is hoped that the instruments will be most punctually in the time of reading the observations. 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. 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

**Observation.**

regards were more important reasons.

Professor Phillips, and Negretti and Zambra monometers, and Rutherford's Miniature Thermometers, are recommended. It is recommended that Thermometers be graduated on the Self-Registering Thermometers.

Minimum Thermometer is liable to two dangerous accidents of spirit breaking, and part of the spirit temperature and lodging at the top of the tube. This is of occasional occurrence with Protected Thermometers, but frequent occurrence with exposed Thermometers and of Minimum Thermometers on account of the work carried on by each Observer. Fortunately, Spirit Thermometers may be easily taken in the hand by the end of the tube, and then firmly secured.

Mr J. Stevenson, the Honorary Secretary, and Mr. Dallingar, the Society's Observer at Lallaibus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

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 N.E., S.W., N.W., S.E., and W.N.E.

A modification of Fontin'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 system passes freely through the lid and ease 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

The bulbs of the Thermometers for registering minute flame from a gas-burner; or, if gas be not heated metal will serve instead.

The bulbs of the Thermometers for registering from the sun's rays, and the 1

**Black-Bulb Thermometers.** During night, have a black coating be made, or mended, by the application of lampblack and printer's ink. They are blackened boxes, whose sides protect the bulb. The Maximum should be freely exposed to the sun, so as to receive the heat. The Minimum should rest on wooden supports a few inches apart. Snow must cover either of these Thermometers; nor the sun's rays be allowed to reach them. Black Minimun Thermometer by distillation. Black 'glass jackets' may also be used, being indestructible.

It must, however, be added, that the observation of Solar and Terrestrial Radiation is sufficiently advanced state to warrant the exclusive use of any one of these methods.

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  $20^{\circ}$  or  $30^{\circ}$  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 over-head is free from Clouds it is entered 0, when half covered by Clouds,

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 in the mercury not quite to the top of the tube, but to

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**Verification of Thermometers.** 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 number of the instrument being considerably damaged

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Ochterlyne Tiff, County of Perth, in Lat 56° 23' 24", Long 3° 53' 1", Distance from Sea 45 miles.

Height of Cistern of the Barometer above Mean Sea-level 333 feet, above Ground 3 feet.

During the MONTH of September 1884.

The Hours of Observation are of Greenwich Time.

ELECTRICITY. Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.		HYGROMETER. No. 1034		WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				SEA.		OZONE.		GENERAL REMARKS.				Days of Month.		
	9 h. A.M.		9 h. P.M.		Protected in shade, & exposed above ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer No. _____		No. of hours in which it fell.	Amount in inches.	P.M.	Velocity (0—6), Amount (0—10), and Direction, Spd. & Dir. No.	Velocity (0—6), Amount (0—10), and Direction, Spd. & Dir. No.	SUNSHINE	9 h. A.M.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at depth of feet, No. _____	Temperature at 9 A.M. and 9 P.M.	0—10.	0—10.	Mention the hour at which Storms, including Thunder and Lightning, began and ended.				
	Barometer, No. 211 inches.	Attached Ther- mometer No. 211 inches.	Barometer, No. 1034 inches.	Attached Ther- mometer No. 1034 inches.	Max. Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	Hours.	9 h. A.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.	9 h. P.M.			
1	29.244	57	29.240	58	59	35	74	35	55	51.0																							
2	29.218	58	29.218	58	65	43	105	42	54	50.9																							
3	29.322	58	29.322	58	63	41	107	39	55	52.1																							
4	29.300	57	29.258	58	65	41	105	40	52	49.9																							
5	29.224	58	29.236	58	64	44	105	41	49	46.4																							
6	29.224	57	29.062	58	64	34	112	32	47	43.4																							
7	29.136	57	29.492	60	65	47	109	48	54	49.1																							
8	29.668	59	29.724	61	66	43	113	39	56	52.6																							
9	29.788	61	29.860	63	65	62	103	52	59	57.8																							
10	29.924	63	29.950	63	68	57	82	55	63	62.2																							
11	30.044	63	30.150	64	69	56	83	56	59	58.3																							
12	30.222	62	30.244	63	68	57	76	54	55	54.8																							
13	30.242	60	30.174	62	67	44	107	48	52	51.0																							
14	30.140	60	30.042	63	71	39	112	38	49	48.3																							
15	29.992	62	29.954	62	67	47	107	52	54	52.2																							
16	29.926	62	29.922	61	61	57	73	52	57	54.9																							
17	29.988	61	30.082	63	59	54	63	54	59	57.4																							
18	30.150	62	30.116	63	72	49	103	45	61	58.5																							
19	30.034	62	29.888	64	71	57	104	49	58	56.3																							
20	29.778	62	29.516	64	64	52	88	53	59	57.8																							
21	29.296	63	29.200	62	67	56	104	51	59	57.9																							
22	29.252	60	29.428	58	61	41	64	37	54	57.1																							
23	29.644	58	29.650	57	69	41	97	38	53	48.1																							
24	29.444	58	29.500	58	61	48	103	49	56	53.2																							
25	29.674	58	29.452	58	59	47	93	44	55	50.9																							
26	29.352	57	29.3%	56	57	48	68	48	52	49.9																							
27	28.986	57	29.744	56	59	44	98	42	55	52.3																							
28	29.324	55	29.368	55	58	45	109	44	57	50.2																							
29	29.624	56	29.692	55	61	42																											







# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Achterlyne Cliff, County of Perth, in Lat. 56° 23' 24", Long. 2° 53' 10", Distance from Sea 45 miles.  
 Height of Cistern of the Barometer above Mean Sea-level 333 feet, above Ground 3 feet. During the MONTH of November 1884.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER, No. 1033.				WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.		OZONE.		GENERAL REMARKS.			Days of Month.										
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer, No. —		No. of hours in which it fell.	Amount (0—6), and Direction, Force.	Velocity (0—6), Amount (0—10), and Direction, Force.	Velocity (0—6), Amount (0—10), and Direction, Force.	SUNSHINE.	9 h. A.M.		Temperature at depth of Well at 10 ft. No. —		Temperature at 10 ft., and Density, 9 A.M. 9 P.M.		As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.			Days of Month.				
	Barometer, inches.	Attached Ther- mometer No. 211	Barometer, inches.	Attached Ther- mometer No. 1041	Max. No. 4088	Min. No. 4041	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	9 h. A.M.	9 h. P.M.	No. —	9 h. A.M.	9 h. P.M.	Hours.	No. 8 inches,	No. 12 inches,	No. 22 inches,	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9 A.M.	9 P.M.						
1	29.408	53	29.502	52	55	45	53	45	53	57.4	53	57.4	SW 3	SW 0	6 Sat ground	0.90	6	10	0	10	0	50.5	48.5	48.8	SW 1	W 0	0.52	1	5	3	6	5	48.5	49	48.5	1	
2	29.067	51	29.524	41	54	40	53	42	43	41.0	54	40	W 0	W 0	0.03	3	3	0	10	5	45	48	48.5	SW 0	SW 2	0.02	4	10	4	8	0	44	47	48.5	2		
3	29.074	49	29.642	48	47	32	61	30	40	38.3	47	32	W 3	SW 2	0.79	6	9	6	6	7	46.5	47.5	48	W 0	SW 0	0.16	1	14	0	10	5	44	47	48.5	3		
4	29.568	47	28.862	48	48	35	84	31	40	36.9	48	35	SW 2	W 1	1.11	6	9	1	1	0	45	46	47.5	SW 2	W 1	0.15	6	10	6	10	0	48	45.5	47.5	4		
5	28.922	49	29.222	49	52	36	52	36	48	46.3	52	46.3	W 1	W 1	0.76	3	5	4	7	2	47	46	46.5	W 0	SW 0	0.05	2	5	14	6	14	43	46	47	5		
6	29.498	48	29.536	49	50	37	57	31	43	41.1	50	37	W 0	SW 0	0.05	2	5	14	6	14	43	46	47	SW 2	W 1	0.11	4	10	0	10	0	48	45.5	47.5	6		
7	29.056	50	29.372	48	54	37	88	35	53	52.1	54	37	SW 2	W 1	1.11	6	9	1	1	0	45	46	47.5	SW 2	W 1	0.15	6	10	6	10	0	48	45.5	47.5	7		
8	29.558	47	29.444	48	50	34	56	31	43	41.8	50	34	SW 2	W 1	0.76	3	5	4	7	2	47	46	46.5	SW 2	W 1	0.15	6	10	6	10	0	48	45.5	47.5	8		
9	29.512	50	29.808	50	51	41	66	41	50	44.8	51	41	W 1	W 1	0.76	3	5	4	7	2	47	46	46.5	W 0	SW 0	0.05	2	5	14	6	14	43	46	47	9		
10	30.100	48	30.084	49	54	35	82	30	39	37.2	54	35	W 0	SW 0	0.05	2	5	14	6	14	43	46	47	W 0	SW 0	0.05	2	5	14	6	14	43	46	47	10		
11	29.970	49	29.918	50	50	34	76	31	49	47.2	50	34	SW 2	W 0	0.01	4	10	0	10	0	48	45.5	47.5	SW 0	SW 0	0.09	2	10	2	7	0	46	46.5	47.5	11		
12	29.806	48	29.852	49	50	43	52	43	45	43.5	50	43	SW 0	SW 0	0.09	2	10	2	7	0	46	46.5	47.5	SW 0	SW 0	0.05	2	5	14	6	14	43	46	47	12		
13	30.116	46	30.242	47	46	31	47	27	35	33.8	46	31	W 0	W 0	0	0	0	0	0	4	42	46	47	W 0	W 0	0.17	0	0	0	0	0	3	4	42	47	47	13
14	30.300	43	30.204	45	51	24	83	26	28	26.6	51	24	W 0	W 0	0	0	0	0	0	4	42	46	47	W 0	W 0	0	0	0	0	0	3	4	42	47	47	14	
15	30.188	42	30.112	43	40	24	76	23	28	26.8	40	24	W 0	W 0	0	0	0	0	0	4	42	46	47	W 0	W 0	0.02	1	1	0	10	12	36	42	46.5	15		
16	30.042	41	29.992	43	34	26	41	25	32	31.1	34	26	SW 0	SW 0	0	0	0	0	0	3	41	44	44.5	SW 0	SW 0	0	0	0	0	0	34	41	44.5	16			
17	30.024	41	30.168	42	38	30	45	38	35	33.4	38	30	SW 0	SW 0	0	0	0	0	0	2	37.5	41	44	SW 0	SW 0	0.17	0	0	0	0	0	3	3.5	41	44	44.5	17
18	30.218	42	30.338	43	45	32	69	28	36	33.1	45	32	SW 0	SW 0	0	0	0	0	0	2	38	41	43.5	SW 0	SW 0	0.5	3	3	0	0	2	3	38	41	43.5	18	
19	30.200	43	30.150	45	45	33	70	26	42	37.3	45	33	SW 0	SW 0	0	0	0	0	0	1	37.5	40.5	43.5														

# 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 permanent, unbroken, 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 results from two Stations, so very considerable as to render them quite incomparable, may give a dissimilarity in the position or shape of instruments, different hours of observation, or even from observer to observer, in some few instances, they are speedily requested to make opposite every such instance.

The Council recommend that Observations be made precisely at the time at which it was taken, if not at 9 A.M. or 9 P.M., but in achieving a more uniformity in the observations, the following Directions, seems for their Weather-Glasses and Aneroids, though well-suited to indicate roughly variations of atmospheric pressure, are not of occasional occurrence with Protected Thermometers, but of

as specified in the following remarks, or at the top of the columns of the Schedule. It is hoped that the

Professor Phillips, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer is recommended, that those in the use of the Society's Reports must inevitably be used.

Observations, in some few instances, may find this impossible; Thermometers are recommended by each Observer.

Fortunately, Shift 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, and usually called the Board of Rate Barometer, has the great convenience of regulating no adjustment of the easiest. Its scale is not true inches, but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of the Standard more than 0.003 inch.

A modification of Prof. Barometer is used at a number of the Society's Stations, by which the concidence of the zero point with the surface of the mercury is indicated by a little ivory float, whose index passes freely through the lid and ease of the system. When the index-line on this little piston is bright, by adjusting the screw, to form one straight line with those on its ivory frame, the sum should rest on wooden supports a few inches from the surface of the glass, in open situation. Show must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation. Black-balls enclosed in glass jaskets, may also be used, being, indeed, preferable to the

Black-Ball. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit, till it unites with the column of spirit, 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 bottom. But another method must be adopted, if the portion of spirit in the top of the tube be small.

The bulb of the Thermometers, provided with a glass-jacket, will serve instead. They are placed in shallow blackened boxes, those provided with the bulb's neck, the eye being turned to the light, and the least from radiation, ground, over grass.

The bulb of the Thermometers, for registering the greatest heat of the sun's rays, and the least from radiation, by the application of a mixture of turpentine and linseed oil, and the heat of the sun, by means of lampblack and painter's ink. They are placed in shallow blackened boxes, those provided with the bulb's neck, the eye being turned to the light, and the least from radiation, ground, over grass.

The Hygrometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the system, which is made of flexible leather, thus rising or depressing the surface till it just meets the eye point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr. Ade of London, and usually called the Board of Rate Barometer, has the great convenience of regulating no adjustment of the easiest. Its scale is not true inches, but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of the Standard more than 0.003 inch.

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The bulb of the Thermometers, for the measurement of temperature, is first 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 must be covered, and altogether placed to the side, and a little below the level of the wet bulb, but in case under the bulb, the glass must be of medium fineness, and fastened to the neck of the thermometer, which also supplies it with water. It must be exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall headed by a flue. The object being to secure that the bulb must then be gently tapped, and the eister-adjustment carefully made. The eye, by raising and lowering, it must be read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

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The errors most frequently made in reading the Barometer are of 1-000 inch, 0-500 inch, and 0-50 inch; that is to say, instead of 29-365 inches, either of the following will be read—viz., 29-365 inches, 28-365 inches, or 29-815 inches.

The use of a lens will facilitate an accurate adjustment and reading much, delicacy, and must be made with great care. The bulb must be immersed in water before the hour of the Barometer is to be used, and the tube will then facilitate the reading of the mercury.

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 as in a good light as can be conveniently obtained, so as to warrant the exclusive recommendation of any one of these methods.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted in a frame, 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 must be covered, and altogether placed to the side, and a little below the level of the wet bulb, but in case under the bulb, the glass must be of medium fineness, and fastened to the neck of the thermometer, which also supplies it with water. It must be exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall headed by a flue. The object being to secure that the bulb must then be gently tapped, and the eister-adjustment carefully made. The eye, by raising and lowering, it must be read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

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# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Walterley's Cottages, County of Perth, in Lat. 56° 23' 24", Long. 3° 53' 1", Distance from Sea 45 miles.

Height of Cistern of the Barometer above Mean Sea-level 333 feet, above Ground 3 feet.

During the MONTH of December 1884.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER, No. 1034		WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.		OZONE.		GENERAL REMARKS.		Days of Month.					
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer.		No. of hours in which it fell	Amount in inches.	Velocity (0-5) and Direction.	Velocity (0-10) and Direction.	Velocity (0-10) and Direction.	SUNSHINE.	9 h. A.M.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at depth of feet, No.	Temperature at 11 a.m.	0-10.	9 A.M.	9 P.M.
	Barometer, * No. 211 inches.	Attached Thermometer, No. 211 inches.	Barometer, No. 211 inches.	Attached Thermometer, No. 211 inches.	Max. No. 1038	Min. No. 1039	Max. in Sun's rays No. 1038	Min. on grass No. 1039	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	No. 9 h. A.M.	No. 9 h. P.M.	Direction.	Force.	Direction.	Force.	Hours.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at depth of feet, No.	Temperature at 11 a.m.	0-10.	9 A.M.	9 P.M.		
1	29.692	34	29.662	34	32	77	31	74	30	28.8	6	0	8	0	6 feet from ground	0	10	0	10	0	33.5	34.5	40.5			1			
2	29.656	34	29.628	39	34	28	34	29	33	32.1	8	0	0	0	—	2	10	0	10	8	34	34	40			2			
3	28.562	40	28.734	41	39	31	48	30	38	37.1	6	0	W	15	1.08	0	10	0	0	34	37	40			3				
4	28.694	40	28.878	39	41	31	46	24	33	31.8	6	0	SW	1	0.03	0	10	0	16	34	34.5	40			4				
5	29.100	39	29.048	40	39	30	52	24	33	32.2	8	0.5	0	0	28.06	2	2	0	0	0	34.5	36.5	39.5			5			
6	28.876	42	28.784	43	46	32	63	30	45	42.2	8	0	W	3	0.31	4	8	0	10	0	36	36.5	39.5			6			
7	29.000	42	28.869	43	46	36	50	32	42	40.1	8	2	SW	0	0.35	5	10	0	10	0	34	38	39			7			
8	28.950	42	29.192	42	46	31	46	31	34	35.2	8	1.5	SW	2	0.72	5	9	0	5	5	34	34.5	39			8			
9	29.282	42	29.404	40	40	31	47	31	33	32.2	8	0	W	0	1.25	6	8	4	8	0	36.5	38	39.5			9			
10	29.182	42	28.800	45	43	31	58	24	43	41.8	8	3	SW	1.5	0.20	5	7	0	5	7	38	34.5	39			10			
11	28.762	45	29.292	45	47	41	44	38	46	42.3	8	3	SW	1.5	0.39	3	8	0	10	0	40.5	39	39.5			11			
12	29.532	44	29.340	46	48	34	52	30	39	36.6	8	0	SW	2	0.02	0	10	3	7	0	38.5	39.5	40			12			
13	29.384	45	29.442	47	50	36	57	36	44	44.8	8	2	SW	0	0.14	2	8	0	10	34	44	40			13				
14	29.028	47	29.014	44	53	40	63	35	42	40.2	8	0	W	3	0.54	6	10	3	3	0	44	41	40.5			14			
15	29.056	43	29.132	42	43	33	45	31	34	32.8	8	2	W	2	0.29	0	10	0	10	7	39	44	41			15			
16	29.214	41	29.104	41	37	31	53	32	35	33.6	8	1	W	0	0.20	2	8	0	10	0	34	39	40			16			
17	29.050	40	29.332	39	38	25	50	21	29	27.2	8	2	W	1	0.25	1	1	0	0	2	36	38.5	40			17			
18	29.016	40	28.784	40	36	26	50	25	35	33.2	8	1	W	1.5	0.07	4	10	0	7	2	35.5	38.5	40			18			
19	28.656	41	28.626	40	40	32	47	31	36	34.2	8	1	W	0	0.33	3	8	0	0	0	36	34.5	39.5			19			
20	28.828	40	29.479	41	41	38	45	26	36	33.0	8	0	W	2	0.07	3	3	0	1	3	35	34.5	39			20			
21	29.186	40	30.034	40	43	32	63	26	37	32.5	8	2	SW	0	0.07	3	3	0	1	3	35	34.5	39			21			
22	30.050	37	29.930	36	41	21	66	21	34	22.8	8	0	SW	0	0	0	0	8	5	33.5	36.5	38.5			22				
23	29.844	36	29.808	36	35	20	62	20	25	23.4	8	0	SW	0	0	2	5	0	7	0	33.5	36	38			23			
24	29.788	38	29.814	38	39	23	34	21	34	35.2	8	0	SW	0	0	3	1	3	5	6	33.5	36	38			24			
25	29.848	38	29.852	37	45	32	73	24	34	34.8	8	0	0	0	0.01	2	2	0	0	2	33.5	36	38			25			
26	29.760	36	29.748	38	39	23	53	20	31	29.5	8	0	W	0	0	1	7	2	2	34	33.5	35.5	38			26			
27	29.882	37	29.776	38	37	28	44	24	31	30.1	8	0	SW	0	0.01	3	8	4	8	0	33	36.5	37.5			27			
28	29.734	38	29.642	39	41	30	45	30	36	34.9	8	0	W	0	0.01	2	10	0	10	0	33.5	35.5	37.5			28			
29	29.520	40	29.572	40	37	31	40	32	34	35.1	8	1																	

# 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 1853, was to secure practical unparoony 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 Monthly Return, pay attention to the following Directions, save for their lab or pain involved in making them; and, for the Tables published by the Society, an entire conformance with the above.

The Council recommend that Observations be made precisely at 9 A.M. and 9 P.M. (Greenwich or Railway Time) on the top of the columns of the Schedule.

**Observation.** As far as possible, the Instruments will be used for scientific purposes. No Barometer should,

be used for Meteorological Observation, that is not supplied with some means of adjustment or composition which will secure that the height of the mercury in the tube is accurately measured from the mercury point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr. Atte of London, and usually called the Board of Trade Barometer, has its scale surface of the mercury in the cistern is entirely got rid of. For its 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 of the air, in sufficient rapidity, with the result that none of the readings diffused from those ivory points which forms the zero point of the fixed scale.

The Barometer in which the error arising from the fluctuating height of the mercury in the cistern is removed, is brought into the hands of the Standard more than 0003 inch.

A modification of Fornit's Barometer is used at a number of the Society's Stations, by the coincidence of the zero points with the surface of the mercury indicated by a little ivory float. When the index-line on this little piston is brought into contact with the zero point of the fixed scale, the eye, by raising and lowering it, must be able to hang against a wall headed by a flat.

To show the accuracy with which these Barometers are made, it may be stated, that one was composed, during a whole year, with heads 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, but, when compared with the result of the readings diffused from those ordinary Observers, it must be 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 cistem-adjustment carefully made. The eye, by raising and lowering it, must be brought into the plane of the back and front of the index-actually the lower edge of the vessel, 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 eye to the matter of the Barometer, will be avoided by those who have observed the level of the air surface in the instrument which is in direct contact with the glass tube, must be carefully avoided.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be removed 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 within a quarter of an inch of it, and take off the instrument; it should then be carried with the cistem 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 noting 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 cleared 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 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 leathern operation to get it wholly excluded. 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 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.

## METEOROLOGICAL OBSERVATIONS,

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, however, extra Sea Observations might be taken for other purposes, painted white inside and outside, and Thermometers, secured 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 register, By the laws of the Royal Society, Members and Observers have a right to have their instruments compared by the Secretary, and T. Stevenson, and already commented at Peterhead and Liverpool.

The Temperature of the water at the bottom of Wells ought to be ascertained, and the depth of the water being noted.

Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right

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

Very great care should be bestowed on the Observations of the Wind, and the accuracy of which, both as regards Direction and Force, is so essential towards the right

wind is fuel, reference may be made to the direction of shades 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 the top of the tube. This disarrangement of the relation of the force of the wind to Barometric

Gradients, and other points connected with storms, the Council would recommend the Hemispherical Cup Anemometer, a self-registering instrument which shows the

amount of Wind that passes at the top of the column.

**Anemometer.** Basins special and extraordinary Observational phenomena generally. A proper meteorological Observatory is, in truth, necessary to every complete meteorological observatory.

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.

**Ozone.** 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  $\text{S}^{\text{W}}$ , as an Ozone entry in the schedule will indicate that the Ozone paper is tilted as 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 condensation of the atmosphere, and a list of such as are in general use are given

every advantage of, and a list of such as are in connection with terrestrial

Atmospheric, barometrical, thermometrical, and meteorological phenomena generally. A proper meteorological Observatory is, in truth, necessary to every complete meteorological observatory.

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

in all cases, but the depth of the

Temperature of the water being noted.

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

**Remarks.** Remarks ought to be made on the occurrence of Accidents, Rains, Thunderstorms, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, Rain, and other phenomena.

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