

Official, No. 34.

CONTRIBUTIONS  
TO OUR  
KNOWLEDGE OF THE METEOROLOGY  
OF THE  
ARCTIC REGIONS.

Published by the Authority of the Meteorological Council.



PART III.

LONDON:  
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,  
AND SOLD BY  
J. D. POTTER, 31 POULTRY; AND EDWARD STANFORD, 55 CHARING CROSS.

1882.

*Price Six Shillings.*



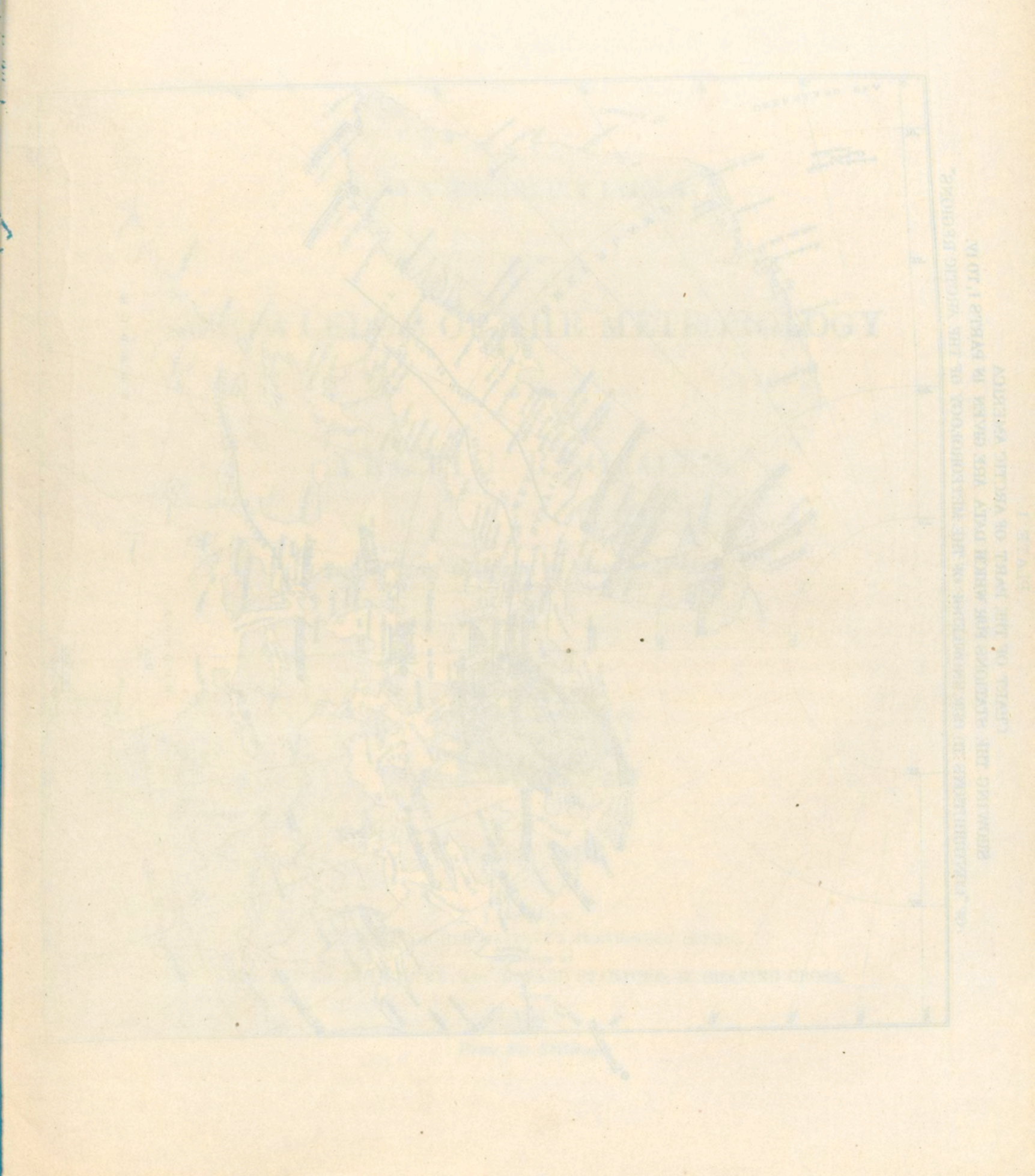
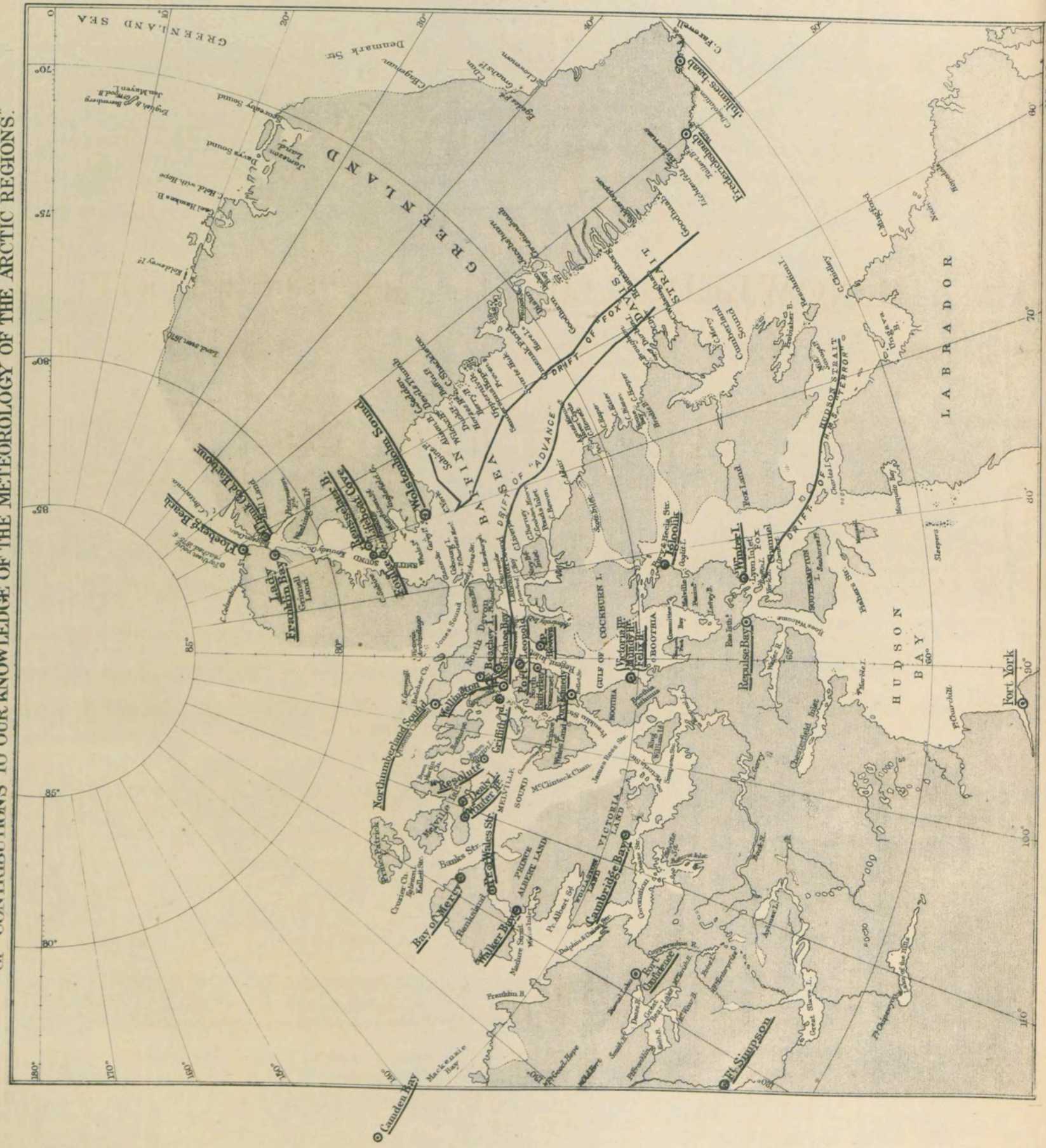




PLATE I.  
CHART OF THE PART OF ARCTIC AMERICA  
SHOWING THE STATIONS FOR WHICH DATA ARE GIVEN IN PARTS I, TO IV.  
OF "CONTRIBUTIONS TO OUR KNOWLEDGE OF THE METEOROLOGY OF THE ARCTIC REGIONS."



Official, No. 34.

CONTRIBUTIONS  
TO OUR  
KNOWLEDGE OF THE METEOROLOGY  
OF THE  
ARCTIC REGIONS.

Published by the Authority of the Meteorological Council.



PART III.

LONDON:  
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,  
AND SOLD BY  
J. D. POTTER, 31 POULTRY; AND EDWARD STANFORD, 55 CHARING CROSS.

1882.

Price Six Shillings.



ERRATA IN PARTS I. AND II.

- Page 20, line 21, 0° to 9° F., should be 32° to 41° F.  
,, 29, column 5, should be headed Mean Sea.  
,, 71, in table B., the resultant direction for July should be N. 7° E.  
,, 100, table V., January range 57°·5, should be 60°·5.  
,, 130, table III., at top of Min. column, insert inches, and at top of Temp. column, insert the ° (sign).  
,, 182, line 27, *dele* hour.  
,, 215, Aug. 11, long, should be 92° 36' 45".  
,, 217, line 1, insert " with " after " made."  
,, 245, table II., yearly mean should be +1°·7.

PREFACE TO PART III.

In the preface to Part I. the general plan of these "Contributions to our Knowledge of the Meteorology of the Arctic Regions" has been briefly described. They contain the results of the discussion of observations made on board vessels either frozen up in winter quarters or drifting with the ice, and refer for the most part to the winter season.

It will be noticed from the chart that the observations discussed are confined mainly to the region extending between the meridians of 45° and 120° W., and from the parallel of 60° to that of 80° N.

The following is the List of the Expeditions, the records of which have been employed in the present Part:—

Locality.	Ships.		Captain.	Years.	No. of Months.	Observations.
Winter Harbour - -	H.M.S. "Hecla" and "Griper."		Sir W. E. Parry	1819-20	12	Two-hourly.
Winter Island - -	H.M.S. "Fury" and "Hecla."		Do. do.	1821-2	12	Do.
Igloolik - - -	Do. do.		Do. do.	1822-3	12	Do.
Port Bowen - - -	H.M.S. "Hecla" and "Fury."		Do. do.	1824-5	12	Do.
Port Leopold - -	H.M.S. "Enterprise" and "Investigator."		Sir James C. Ross.	1848-9	12	Do.
Wolstenholm Sound -	H.M.S. "North Star" -	J. Saunders -		1849-50	12	Four-hourly.
Fort Simpson - - -	- - -	W. J. S. Pullen		1849-51	17	8 or 6 daily.
Drifting in the Pack -	"Advance" and "Rescue"	E. J. De Haven, U.S.N.		1850-1	9	General results.
Walker Bay - - -	H.M.S. "Enterprise" -	Sir R. Collinson		1851-2	12	Four-hourly.
Cambridge Bay - - -	Do. - - -	Do. do.		1852-3	12	Do.
Camden Bay - - -	Do. - - -	Do. do.		1853-4	11	Do.

The meteorological observations made at Port Leopold, Wolstenholm Sound, Fort Simpson, Walker Bay, Cambridge Bay, and Camden Bay have never been published, and have not before been fully discussed. The work, as before, has been entirely carried out by Mr. Richard Strachan.

August 23rd, 1882.

R. H. Scott.



# CONTENTS.

## PART III.

No.		Page
No. XV.	RESULTS OF METEOROLOGICAL OBSERVATIONS MADE IN	
	WINTER HARBOUR, MELVILLE ISLAND - - - - -	255
	TEMPERATURE - - - - -	258
	WINDS AND GALES - - - - -	260
	SNOW - - - - -	261
	THICKNESS OF ICE - - - - -	262
	ANIMALS, &c. - - - - -	262
	LUMINOUS PHENOMENA - - - - -	263
	CLOUDS - - - - -	264
	PARHELIA - - - - -	264
	AURORÆ - - - - -	271
	TABLE I. MEAN TEMPERATURE OF THE AIR - - - - -	275
	" II. MEANS AND EXTREMES OF BAROMETER - - - - -	276
	" III. MEANS AND EXTREMES OF AIR TEMPERATURE - - - - -	276
	" IV. SUMMARY OF WINDS - - - - -	277
	" V. WEATHER NOTATIONS - - - - -	278
	" VI. TEMPERATURE OF THE SEA - - - - -	278
No. XVI.	RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT	
	WINTER ISLAND - - - - -	279
	TEMPERATURE OF THE SEA AT DEPTHS - - - - -	283
	TABLE I. MEAN TEMPERATURE OF THE AIR - - - - -	284
	" II. MEANS AND EXTREMES OF BAROMETER - - - - -	285
	" III. MEANS AND EXTREMES OF AIR TEMPERATURE - - - - -	285
	" IV. SUMMARY OF WINDS - - - - -	286
	" V. WEATHER NOTATIONS - - - - -	287
	" VI. TEMPERATURE OF THE SEA - - - - -	287
	AURORÆ AND LUMINOUS METEORS - - - - -	288
	ON THE FREEZING-POINT OF DISTILLED MERCURY, AND AMALGAMS OF	
	MERCURY - - - - -	295
No. XVII.	RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT	
	IGLOOLIK - - - - -	297
	EARTH TEMPERATURE - - - - -	300
	TABLE I. MEAN TEMPERATURE OF THE AIR - - - - -	301
	" II. MEANS AND EXTREMES OF BAROMETER - - - - -	302
	" III. MEANS AND EXTREMES OF AIR TEMPERATURE - - - - -	302
	" IV. SUMMARY OF WINDS - - - - -	303
	" V. WEATHER NOTATIONS - - - - -	304
	" VI. TEMPERATURE OF THE SEA - - - - -	304
	AURORÆ AND LUMINOUS METEORS - - - - -	304



No.	RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT	Page
No. XVIII.	PORT BOWEN - - - - -	307
	HYGROMETRICAL OBSERVATIONS - - - - -	308
	ARCTIC WINTERS - - - - -	310
	SENSATION OF COLD - - - - -	310
	WINDS - - - - -	311
	SNOWS - - - - -	311
	THICKNESS OF ICE - - - - -	312
	TEMPERATURE OF THE SEA - - - - -	312
	SOUND - - - - -	312
	SUNSHINE - - - - -	312
	CLOUD - - - - -	313
	HALOS - - - - -	313
	AUROSÆ - - - - -	313
	TABLE I. MEAN ATMOSPHERIC PRESSURE - - - - -	317
	„ II. MEAN TEMPERATURE OF THE AIR - - - - -	317
	„ III. EXTREMES OF ATMOSPHERIC PRESSURE - - - - -	318
	„ IV. EXTREMES OF AIR TEMPERATURE - - - - -	318
	„ V. SUMMARY OF WINDS - - - - -	319
	„ VI. WEATHER NOTATIONS - - - - -	320
No. XIX.	PORT LEOPOLD - - - - -	321
	TEMPERATURE OF THE SEA - - - - -	323
	REMARKS - - - - -	323
	TABLE I. MEANS OF BAROMETRICAL OBSERVATIONS - - - - -	326
	„ II. MEAN TEMPERATURE OF THE AIR - - - - -	326
	„ III. EXTREMES OF ATMOSPHERIC PRESSURE - - - - -	327
	„ IV. EXTREMES OF TEMPERATURE - - - - -	327
	„ V. SUMS OF WIND COMPONENTS - - - - -	328
	„ VI. COMPONENT AND RESULTANT WINDS - - - - -	330
	„ VII. MONTHLY RESULTANTS OF WINDS - - - - -	330
	„ VIII. CALMS - - - - -	330
	„ IX. SUMMARY OF WINDS - - - - -	331
	„ X. WEATHER NOTATIONS - - - - -	332
No. XX.	WOLSTENHOLM SOUND - - - - -	334
	TABLE I. MEAN READINGS OF ANEROID - - - - -	337
	„ II. MEAN TEMPERATURE OF THE AIR - - - - -	337
	„ III. EXTREME READINGS OF THE ANEROID - - - - -	338
	„ IV. EXTREMES OF AIR TEMPERATURE - - - - -	338
	„ V. SUMS OF WIND COMPONENTS - - - - -	339
	„ VI. COMPONENT AND RESULTANT WINDS - - - - -	340
	„ VII. MONTHLY RESULTANTS OF THE WINDS - - - - -	340
	„ VIII. SUMMARY OF THE WINDS - - - - -	341
	„ IX. WEATHER NOTATIONS - - - - -	342
	REMARKS - - - - -	343

No.	RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT	Page
No. XXI.	FORT SIMPSON - - - - -	345
	TABLE I. RESULTS - - - - -	347
	„ II. AMOUNT AND CHARACTER OF CLOUDS - - - - -	350
	„ III. EXTREME READINGS OF ANEROID - - - - -	351
	„ IV. EXTREMES OF AIR TEMPERATURE - - - - -	351
	„ V. SUMMARY OF WINDS - - - - -	352
	REMARKS - - - - -	353 to 362
No. XXII.	RESULTS OF METEOROLOGICAL OBSERVATIONS MADE DURING THE ARCTIC DRIFT OF THE "ADVANCE" AND "RESCUE" - - - - -	363
	TABLE I. DRIFT OF THE "ADVANCE," 1850-1 - - - - -	368
	„ II. MEANS AND EXTREMES OF THE MEAN DAILY READINGS OF ANEROID - - - - -	369
	„ III. MEANS AND EXTREMES OF AIR TEMPERATURE - - - - -	369
	„ IV. SUMMARY OF WINDS - - - - -	370
	„ V. WEATHER NOTATIONS - - - - -	371
	REMARKS - - - - -	371 to 374
No. XXIII.	RESULTS OF THE METEOROLOGICAL OBSERVATIONS MADE AT WALKER BAY - - - - -	375
	PREVAILING WINDS, IN DAYS - - - - -	378
	CHARACTER OF THE CLOUDS - - - - -	378
	AUROSÆ - - - - -	379
	TEMPERATURE OF THE SEA - - - - -	379
	THICKNESS OF ICE - - - - -	379
	TEMPERATURE AT OBSERVATORY - - - - -	380
	SOLAR RADIATION - - - - -	380
	GAME LIST - - - - -	380
	TABLE I. MEAN BAROMETRICAL PRESSURE - - - - -	381
	„ II. MEAN TEMPERATURE OF THE AIR - - - - -	381
	„ III. EXTREMES OF ATMOSPHERIC PRESSURE - - - - -	382
	„ IV. EXTREMES OF AIR TEMPERATURE - - - - -	382
	„ V. SUMS OF WIND COMPONENTS - - - - -	383
	„ VI. COMPONENT AND RESULTANT WINDS - - - - -	384
	„ VII. MONTHLY RESULTANTS OF THE WINDS - - - - -	384
	„ VIII. SUMMARY OF WINDS - - - - -	385
	„ IX. WEATHER NOTATIONS - - - - -	386
	NOTES - - - - -	387
No. XXIV.	RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT CAMBRIDGE BAY - - - - -	389
	PREVAILING WINDS, IN DAYS - - - - -	391
	TEMPERATURE OF THE SEA - - - - -	391
	THICKNESS OF ICE - - - - -	391
	SOLAR RADIATION - - - - -	392
	GAME LIST - - - - -	392



No. XXIV. RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT  
CAMBRIDGE BAY—*cont.*

TABLE	I.	MEAN BAROMETRICAL PRESSURE	-	-	-	393
"	II.	MEAN TEMPERATURE OF THE AIR	-	-	-	393
"	III.	EXTREMES OF ATMOSPHERIC PRESSURE	-	-	-	394
"	IV.	EXTREMES OF AIR TEMPERATURE	-	-	-	394
"	V.	SUMS OF WIND COMPONENTS	-	-	-	395
"	VI.	COMPONENT AND RESULTANT WINDS	-	-	-	396
"	VII.	MONTHLY RESULTANTS OF THE WINDS	-	-	-	396
"	VIII.	SUMMARY OF WINDS	-	-	-	397
"	IX.	WEATHER NOTATIONS	-	-	-	398
NOTES	-	-	-	-	-	399

No. XXV. RESULTS OF METEOROLOGICAL OBSERVATIONS MADE AT  
CAMDEN BAY

PREVAILING WINDS, IN DAYS	-	-	-	-	-	401
TEMPERATURE OF THE SEA	-	-	-	-	-	402
THICKNESS OF ICE	-	-	-	-	-	403
SOLAR RADIATION	-	-	-	-	-	403
TABLE	I.	MEAN BAROMETRICAL PRESSURE	-	-	-	404
"	II.	MEAN TEMPERATURE OF THE AIR	-	-	-	404
"	III.	EXTREMES OF PRESSURE	-	-	-	405
"	IV.	EXTREMES OF TEMPERATURE	-	-	-	405
"	V.	SUMS OF WIND COMPONENTS	-	-	-	406
"	VI.	COMPONENT AND RESULTANT WINDS	-	-	-	407
"	VII.	MONTHLY RESULTANTS OF THE WINDS	-	-	-	407
"	VIII.	SUMMARY OF WINDS	-	-	-	408
"	IX.	WEATHER NOTATIONS	-	-	-	409
NOTES	-	-	-	-	-	410 to 412

No. XV.

Results of Meteorological Observations made at Winter  
Harbour, Melville Island.

H.M. SHIPS "HECLA" AND "GRIPER," under the command of Captain, afterwards Admiral Sir W. E. Parry, F.R.S., wintered at Melville Island in 1819-20. Lieut. Matthew Liddon was in command of the "Griper," and Captain, now General, Sir E. Sabine, K.C.B., late P.R.S., was astronomer to the expedition. The year to be dealt with commences with September 1819, and ends with August 1820.

On September 1st, at noon, the ships were in latitude 75° N., longitude 106° 8' W. On the 16th their position was latitude 74° 23', longitude 112° 30', and a strong westerly current was experienced. On the 17th they were in latitude 74° 22', longitude 112° 51', and the current was W. 2 miles per hour, due to Wly. and NWly. gales. "After the springing up of a breeze such a current generally commences running upon the surface in the Polar Seas." On the 18th "the current was still running so fast to the westward that we were now swept back along the land at the rate of 1¼ miles per hour."

On the 24th the expedition arrived at the entrance to Winter Harbour, which was then frozen over. During the 25th and 26th, a canal was cut in the ice, nearly two and a third miles long, and the ships were warped to a station in five fathoms water, a cable's length from the shore on the north-west side of the harbour, which is on the south coast of Melville Island. Table Hill, a conspicuous object, five or six miles to the westward of the ships, rises about a hundred feet above the plain on which it stands. The winter station was in latitude 74° 47', longitude 110° 48'. The mean rise of the tide was 2 feet 7 inches.

On August 1st, 1820, the expedition left Winter Harbour, and the month was mostly occupied in endeavouring to sail along Melville Island. On the 5th, at noon, the ships were in latitude 74° 22', longitude 112° 48', and the temperature of the sea surface was 31°·2, that of the water brought up from 105 fathoms 32°, the air 34°. The floes in this place were from 40 to 50 feet thick with hummocks from 15 to 25 feet above the sea. On the 11th the latitude was 74° 26' and longitude 113° 43'. On the 14th, about the same spot, the temperature of the sea surface was 34°, wind Wly., and current Ely. 2 or 2½ miles per hour. "The frequent experience we had of the quickness with which currents are formed, in consequence merely of the wind setting the various bodies of ice in motion, naturally leads to this useful caution, that one or two trials of the set of the stream in icy seas must not be too hastily assumed in drawing any conclusion as to the constant or periodical direction." On the 16th the



latitude was  $74^{\circ} 26'$ , longitude  $113^{\circ} 47'$ , from which position the ships retreated eastward. On the 27th their position was latitude  $75^{\circ} 2'$ , longitude  $105^{\circ} 14'$ , depth 94 fathoms, muddy bottom, temperature at bottom  $31^{\circ} \cdot 7$ , surface  $30^{\circ}$ , air  $31^{\circ}$ .

Cape Cockburn was reached on the 28th, meeting with floes of "extraordinary length and continuity, some of them not having a single break or crack for miles together, though their height above the sea was not generally more than twelve inches, and their surface as smooth and even as a bowling green, forming in both these respects a striking contrast to the ice to which we had lately been accustomed more westerly." During the last four days of August the longitude was rapidly run down. On the 29th the latitude was  $74^{\circ} 27'$ , longitude  $95^{\circ} 8'$ ; on 30th, latitude  $74^{\circ} 12'$ , longitude  $88^{\circ} 43'$ ; and the 31st, latitude  $73^{\circ} 54'$ , longitude  $80^{\circ} 25'$ .

The whole of the information contained in this memoir, with the exception of the mean temperatures contained in Table I., has been derived from Sir W. E. Parry's work entitled "Journal of a voyage for the discovery of a North-west Passage from the Atlantic to the Pacific, Second Edition."

The instruments used were no doubt carefully selected, but no particulars regarding them have been recorded, and their errors are unknown. Moreover, the temperature of the mercurial barometer was not recorded; consequently the barometrical observations are of no use for the purpose of determining the diurnal range of pressure. All observations are here given as recorded, without any attempt to apply corrections. "True bearings" are stated to be given in the narrative, and the inference is that the winds are also given according to their true direction. "The temperature of the sea at different depths was obtained, unless otherwise noticed, by Six's self-registering thermometer, confined in an iron case, and attached to the deep-sea lead. The bottle used for bringing up water from different depths below the surface was invented by Doctor Marcet, expressly for the use of this expedition. It consists of a strong and heavy cylindrical box of cast iron having a small aperture at each end; through these apertures passes a bolt, which, when let down into its place, completely closes them, but when held up by means of a catch in the upper part of the box, allows the water to pass through them freely, both at the top and bottom. Being thus set, it is let down to any depth required, by a line passing through a hole in a spherical iron weight about the size of a four-pounder shot, which is retained on board until the instrument is low enough; the weight is then let go, and running rapidly down the line strikes the catch so as to release it, and close the apertures, confining the water which has entered the cylinder. This instrument, from its extreme simplicity and the certainty with which it obtains the water from a known depth, seems the best of any which has yet been adopted for this purpose."

A judgment may be formed of the trustworthiness of the thermometrical results from the following quotation from the published journal of Alexander Fisher, who was assistant-surgeon of the "Hecla." On November 29th the mercury used as an artificial horizon "was found, after being four hours exposed in the open air, at the

temperature of  $36^{\circ}$  below zero, to have frozen into a solid mass: The novelty of the thing immediately excited attention, and in order to be perfectly satisfied that the temperature of the atmosphere was not lower than what was indicated by the thermometer used for registering the temperature on board, another thermometer was tried, and that also fell to only  $36^{\circ}$ . The only way in which I can account for this strange deviation from the general law is that the mercury had become amalgamated with the lead, of which the artificial troughs generally used are made. That some impurity in the mercury is the cause of its freezing at such a low (? high) temperature is obvious, I think, from this circumstance, namely, that the mercury in the mercurial thermometers did not freeze even at  $38^{\circ}$ , and the temperature of the air was registered by it until it exceeded that cold."

The temperatures were registered on board the ships, and Parry remarks, under date October 26th, "By a register of the temperature of the atmosphere, which was kept by Captain Sabine at the observatory, it was found that the thermometer invariably stood at least from  $2^{\circ}$  to  $5^{\circ}$ , and even on one or two occasions as much as  $7^{\circ}$  higher on the outside of the ships, than it did on shore, owing, probably, to a warm atmosphere created round the former by the constant fires kept up on board." On February 14th, it is stated, "In consequence of a comparatively warm atmosphere which was always floating around the ships, the thermometer on board, by which the temperature was noted every two hours, usually stood from  $2^{\circ}$  to  $5^{\circ}$  higher than that fixed on shore, in consequence of which circumstance, the whole of the temperatures, in our meteorological journals, may be taken at least  $2^{\circ}$  or  $3^{\circ}$  lower than those actually registered." Finally, at the end of the year, it is added: "The thermometer, when placed on shore or on the ice at a distance from the ship, invariably stood from  $3^{\circ}$  to  $4^{\circ}$  or  $5^{\circ}$ , and even on some occasions  $7^{\circ}$ , lower than that registered on board. The mean temperature for the year may therefore be fairly considered as  $-2^{\circ}$ ."

Table I., the results of the observations on the temperature of the air, recorded every two hours, have been deduced from the journal of the "Griper" by Sir John Richardson, F.R.S., M.D., and discussed in the Journal of the Royal Geographical Society for 1839. The mean temperature of February, the coldest month, was  $-32^{\circ} \cdot 5$ , of July, the warmest,  $42^{\circ} \cdot 4$ , of the year  $1^{\circ} \cdot 3$ . The diurnal range of temperature is scarcely perceptible in January, and was largest in April,  $13^{\circ} \cdot 3$ .

Tables II. to VI. have been compiled from the meteorological abstracts printed in the narrative.

Table II. deals with the barometrical results, the monthly means and extremes,—giving with the latter the mean temperature of the air, the wind and the weather of the days on which they occurred. The barometrical results are not of much value since no corrections have been made to the observations, not even for the temperature of the mercury. Nevertheless they show that the atmospheric pressure was greatest in May and least in July; that the mercury sunk to 29 inches in March and rose to 30.86 in April. The absolute range of the barometer was therefore 1.86 inches. A range



nearly equal to this occurred in December, but in August it was only 0.57 inch. The weather was finer with the high than with the low pressures.

Table III. discusses the results of the temperature of the air as observed on board the "Hecla." The monthly means do not differ greatly from those deduced from the "Griper's" journal in Table I. The extreme temperatures are accompanied with the height of the barometer, the wind and the weather for the days on which they occurred. The maximum of the year, 60°, occurred in July, the minimum, -50°, in February; range of 110°. The weather was finer with the low than with the high temperatures in winter; but in summer this rule was reversed. Mr. Fisher remarks in his journal that in April the S.E. was the warmest wind, though during the winter they had found no difference in point of warmth from whatever direction the wind was.

Table IV. is a summary of the daily general directions of the wind in each month referred to 16 azimuthal points; with the mean of the forces converted into Beaufort's grades. The prevalent wind was N. or N.N.W. in all months except December, when it was E., though N. and N.W. were also frequent; in June W. were as frequent, though not so strong as the N. winds, and in August the most frequent wind was W.

Table V. summarises the general condition of the weather on each day, according to Beaufort's notation. It would seem, notwithstanding a good deal of mist, that the weather in winter was clearer than in summer. Fog began to attract attention in August. Snow and rain fell on 53 or more days during the year, the frequency of snow-drift making it difficult at times to tell whether or no snow was really falling.

Table VI. brings together the results of the continuous observations on the temperature of the sea-surface.

The following observations were also made:—November 6th, at the bottom in 5 fathoms 30°, surface 28°; on 9th, bottom 31°, surface 28°. February 4th, at noon, temperature of the sea water, in the fire-hole 29°, air -38°, two feet deep in a bank of snow -12°.

The following remarks have reference to the low temperature of the climate as it affected personal sensation. "After being for some days in a temperature of -15° or -20° it felt quite mild and comfortable when the thermometer rose to zero, and *vice versa*." "January 7th was one of the most severe days to the feelings which we experienced during the winter the wind being strong and from the northward with a heavy drift, and the thermometer continuing from -38° to -40°. It is impossible to conceive anything more inclement than such a day, when we could with difficulty pass and repass between the two ships, and were glad to keep every person closely confined on board."

January 11th, noon, temperature of the air -49°, "we walked on shore without inconvenience, the sensation of cold depending much more on the degree of wind at the time than on the absolute temperature of the atmosphere as indicated by the thermometer." . . . "In going from the cabins into the open air, and *vice versa*, we were constantly in the habit for some months of undergoing a change of from 80° to 100°, and, in several instances, 120° of temperature in less than one

minute; and what is still more extraordinary, not a single inflammatory complaint, beyond a slight cold which was cured by common care in a day or two, occurred during this particular period."

February 14th, 4 p.m., to 15th, 7.30 a.m., weather clear and nearly calm, "a thermometer fixed on a pole, between the ships and the shore, never rose above -54°, and was once during that interval, namely, at 6 in the morning, as low as -55°. This low temperature might, perhaps, have continued much longer, but for a light breeze which sprung up from the northward immediately on which the thermometer rose to -49°, and continued still to rise during the day till at midnight it had reached -34°. During the lowest temperature above mentioned, which was the most intense degree of cold marked by the spirit thermometer during our stay in Winter Harbour, not the slightest inconvenience was suffered from exposure to the open air, by a person well clothed, as long as the weather was perfectly calm; but in walking against a very light air of wind, a smarting sensation was experienced all over the face, accompanied by a pain in the middle of the forehead, which soon became rather severe."

Mr. Fisher writes in his journal: "The degree of cold indicated by the thermometer and that conveyed by our feelings are widely different, for whenever there is a breeze of wind we find that it is much more disagreeable to walk about when the thermometer is at 20° above zero, than when it is at zero in a calm." "Whenever the wind increases in strength the thermometer rises, and *vice versa*." "I am of opinion that a much greater degree of cold than 54° below zero might be endured in calm weather without suffering any bad effects from it, for the feelings do not appear by any means to be so sensible after the thermometer has fallen to between 30° and 40° below zero."

The only observations on the direct heating effect of the sun's radiation were made by placing a thermometer in sunshine and comparing its reading with the temperature of the air in shade.

DATE.						TEMPERATURE		WEATHER.
						In Shade.	In Sunshine.	
y.	mo.	d.	h.	m.				
1820	3	15	21	—	-	-24	+24	} Calm and fine.
"	"	"	22	—	-	-23	+27	
"	"	"	23	—	-	-22	+28.5	
"	"	16	Noon.		-	-21	+29	
"	"	"	3	—	-	-13	+19	
"	"	25	Noon.		-	-25	+30	} Very calm and fine.
"	"	"	1	—	-	-22	+17	
"	"	"	2	—	-	-22	+25	
"	"	"	3	—	-	-22	+21	



DATE.					TEMPERATURE.		WEATHER.	
					In Shade.	In Sunshine.		
y.	mo.	d.	h.	m.				
1820	4	26	1	30	-	+ 6.5	+ 17	Calm.
"	"	"	2	—	-	+ 7	+ 22	"
"	"	"	2	13	-	+ 7	+ 23	"
"	"	"	2	18	-	+ 7.6	+ 24.5	"
"	"	"	2	35	-	+ 6.5	+ 20.5	"
"	"	"	2	50	-	+ 6.7	+ 21	"
"	"	"	6	—	-	+ 4.5	+ 9.5	"
"	"	"	23	20	-	+ 5	+ 15	Almost calm.
"	"	"	23	30	-	+ 7	+ 20	"
"	"	"	23	40	-	+ 9	+ 34	"
"	"	"	23	45	-	+ 8.5	+ 23.5	"
"	"	"	23	55	-	+ 8.5	+ 24	"
"	"	27	0	25	-	+ 7	+ 21	"
"	"	"	1	—	-	+ 7.5	+ 20	"
"	"	"	2	20	-	+ 7.7	+ 25	"
"	"	"	2	45	-	+ 4.5	+ 10	A breeze sprung up.

The observations in April were made by Captain Sabine. "Two posts having been fixed in the snow, at a short distance apart, and connected by a line passing through the shadow cast by the observatory, about the middle of the day, two mercurial thermometers, being an exact pair, and having their bulbs unprotected, were suspended from the line, one being exposed to the sun and the other in the shade of the observatory, the bulbs of both were six or eight inches from the snow."

The passages in Sir W. E. Parry's narrative which have special reference to winds and gales are the following:—

"On October 29th the weather was calm and clear, and we remarked, for the first time, that the smoke from the funnel scarcely rose at all, but skimmed nearly horizontally along the housing, the thermometer having got down to  $-24^{\circ}$ , and the mercury in the barometer standing at 29.70 inches."

On November 11th, the thermometer having fallen to  $-26^{\circ}.5$ , the smoke as it escaped from the funnels scarcely rose at all above the housing.

"On November 21st, 12 to 2 a.m., the thermometer rose from  $-46^{\circ}$  to  $-40^{\circ}.5$ , and at half-past 3 a gale came on from the northward, which continued to blow, and the thermometer gradually to rise, till the latter had reached  $-21^{\circ}$  at midnight. This was one of a great many instances which occurred during the winter, of an increase of wind, from whatever quarter, being accompanied by a simultaneous rise in the thermometer. The gale continued strong in the greater part of the two following days, with a tremendous snow-drift, which kept us all on board till the afternoon of the 23rd."

"Between 8 and 9 a.m. on December 26th the wind freshened up very suddenly to a strong breeze from the northward and westward, and during that hour the thermometer rose from  $-20^{\circ}$  to  $-6^{\circ}$ . In the afternoon the wind became moderate

and variable in its direction, and the thermometer had again fallen to  $-17^{\circ}$  at midnight, and continued to fall very gradually for the four following days, till on the 30th it had reached  $-43^{\circ}$ , being the lowest temperature we had yet experienced. During the whole of that interval the weather was nearly calm, and very fine and clear, and at 7.30 a.m. on the 30th, the mercury in the barometer stood at 30.755 inches, being the highest we had yet seen it during the voyage. The colours of the southern sky near the horizon were observed to be remarkably prismatic at noon on that day."

"On December 31st another striking instance occurred of the simultaneous rise in the wind and the thermometer. At 2 a.m. the latter stood at  $-28^{\circ}$ , but the wind freshening up to a strong breeze from the northward and eastward, and afterwards from the S.S.E. in the course of the day, the thermometer gradually rose at the same time, and stood at  $+5^{\circ}$  at midnight.

"The distance at which sounds were heard in the open air, during the continuance of intense cold, was so great as constantly to afford a matter of surprise to us, notwithstanding the frequency with which we had occasion to remark it."

"Lieutenant Beechey and Messrs. Beverly and Fisher, in the course of a walk which led them to a part of the harbour about two miles directly to the leeward of the ships, were surprised by suddenly perceiving a smell of smoke, so strong as even to impede their breathing, till, by walking on a little farther, they got rid of it. This circumstance shows to what a distance the smoke from the ships was carried horizontally, owing to the difficulty with which it rises at a very low temperature of the atmosphere."

"On October 16th a strong gale blew from the northward, with a constant snow-drift: When this snow-drift occurred, as it frequently did during the winter, with a hard gale and the thermometer very low, I believe that no human being could have remained alive after an hour's exposure to it."

"About the middle of October the snow began to fall in smaller flakes than during the summer, and soon after this, whenever it fell, it consisted entirely of very minute *spiculæ*, assuming various forms of crystallization."

December 25th. "The snow which falls during the severe winter of this climate is composed of *spiculæ* so extremely small that it requires very little wind to raise and carry it along."

January 1st. "The quantity of snow which had fallen at this time was so small that its greatest depth on shore did not exceed one or two inches, except where it had drifted into the ravines and hollows."

February 4th. "It was a matter of frequent remark with us that, even on the clearest winter days of this climate, there was usually a considerable deposit of very light snow, which was scarcely perceptible except when interposed between the eye and any dark object, or by the quantity of it which settled on any instrument left to stand in the open air; nor do I think that the heavenly bodies were ever so clearly visible as they are on a winter's night in England."



"On April 19th and 20th the thermometer kept up nearly to zero in consequence of the wind blowing from the E.S.E., and continual snow, of which we remarked when walking on shore on 21st, that as much had fallen in the last two days as during the whole of the winter. The spiculæ were also much less minute than before, though the snow could not as yet be said to fall in flakes."

The changes of temperature during April were rapid, "the thermometer having ranged from  $-32^{\circ}$  to  $+32^{\circ}$  in the course of 20 days. There was at this period more snow upon the ground than at any other time of the year, the average depth on the lower parts of the land being four or five inches, but much less upon the hills; while in the ravines a very large quantity had been collected. The snow at this time became so soft, from the influence of the sun upon it, as to make walking very laborious and unpleasant."

"About May 21st we began to perceive a daily diminution of the snow upon the land, the brown soil appearing in patches, where hitherto the snow had completely covered it."

On May 24th several smart showers of rain fell.

"On June 24th we had frequent showers of snow, which occur in this climate more or less at all times of the year; at this season, however, when the earth is warm, it seldom or never lies on the ground for a whole day together."

"The snow which fell during August 26th was observed for the first time to remain upon the land without dissolving;" and on 28th snow almost entirely covered the land.

The thickness of the ice in the harbour was measured occasionally, and the following are some of the results:—

			Feet. Inches.	
September	24th	- - -	0	7
October	19th	- - -	1	11
March	23rd	- - -	6	6*
May	17th	- - -	7	6
July	6th	- - -	2	0

As indications of change of season and the disappearance of snow and ice, some observations made in June are interesting. On 2nd the red phalarope and also snow-buntings were seen. On 3rd a flock of twelve king ducks, flying to N.E., a raven, an arctic gull, and a golden plover were seen. Flocks of geese and ducks passed almost daily for the next six weeks. On 9th, the first seal was seen, and several mosquitos were caught. The buds of the *saxifraga oppositifolia* and of the dwarf willow were opened out, and sorrel was in flower. On 11th hares were seen. On 20th *saxifraga oppositifolia* was in flower. On 22nd a swan was seen on a pond.

During the stay of the expedition on the shores of Melville Island, the total quantity

\* Snow on the floe 8 inches deep.

of game obtained was 3 musk oxen, 24 deer, 68 hares, 53 geese, 59 ducks, 144 ptarmigan.

Luminous phenomena in the Arctic Regions possess more than usual interest. Sir W. E. Parry's narrative abounds in descriptions of these, some of which of permanent value may here be quoted.

"On October 26th, the sun afforded us sufficient light for writing and reading in my cabin, the stern windows exactly facing the south, from half-past 9 till half-past 2; for the rest of the four-and-twenty hours, we lived, of course, by candle light. Nothing could exceed the beauty of the sky to the south-east and south-west at sunrise and sunset about this period; near the horizon there was generally a rich bluish purple, and a bright arch of deep red above, the one mingling imperceptibly with the other."

November 4th was the last day that the sun would, independently of refraction, be seen above the horizon till February 8th, an interval of 96 days, but the weather was not sufficiently clear to observe the exact day of its disappearance.

On December 21st, "the twilight for some time about noon on the shortest day was sufficient to enable us to walk out very comfortably for nearly two hours. There was, usually, in clear weather a beautiful arch of bright red light overspreading the southern horizon for an hour or two before and after noon, the light increasing, of course, in strength as the sun approached the meridian. Short as the day now was, if indeed any part of the twenty-four hours could properly be called by that name, the reflection of light from the snow, aided occasionally by a bright moon, was at all times sufficient to prevent our experiencing, even under the most unfavourable circumstances, anything like the gloomy night which occurs in more temperate climates."

"On February 1st and 2nd the weather was rather hazy, so that the sun could not have been seen had it been above the horizon, but the 3rd was a beautifully clear and calm day. At 8 a.m., a cross, consisting of the usual vertical and horizontal rays, was seen about the moon. At 20 minutes before apparent noon the sun was seen from the "Hecla's" maintop, at the height of 51 feet above the sea, being the first time that this luminary had been visible to us since November 11th, a period of 84 days, being 12 days less than the time of its remaining actually beneath the horizon, independently of the effects of atmospherical refraction. . . . A vertical column of pale red light extended from the upper part of the sun's disc to about  $3^{\circ}$  of altitude; its intensity was observed to be constantly varying, being at times very bright, at others scarcely perceptible. In these changes, which were exceedingly rapid, it was not unlike the aurora borealis, the light always appearing to shoot upwards, as is most usual in that phenomenon. The breadth of this column, which was visible for about three-quarters of an hour before and after noon, was equal to that of the sun's diameter, and it was much the brightest next the sun. A similar column of light had also been observed by Captain Sabine at 10 a.m., immediately over the spot where the sun was."



February 12th. "We considered the orange and lake tints with which the sky was painted about this period, for two hours before and after noon, to be more rich and beautiful than anything of the kind we had ever before seen. The few fleecy clouds which at any time make their appearance in the heavens during the winter months of this climate had a tendency to form arches both in the northern and southern quarters, extending from east to west, at  $10^\circ$  of altitude in the north, and  $5^\circ$  or  $6^\circ$  in the south."

On March 4th "there were more clouds in the atmosphere, and they were harder and better defined about the edges than they had been before during the winter."

On April 8th the weather was serene and clear, the southern horizon being much raised by refraction. "A few thin white clouds which were floating in the atmosphere to-day had much of that tendency to arch which has before been described on one or two occasions. Two distinct arches were thus formed this morning, one in the northern the other in the southern hemisphere of the heavens, their altitude in the centre being from  $20^\circ$  to  $45^\circ$ , and joining at each end in the E.N.E. and W.S.W. points of the horizon."

"In the afternoon of the 16th, the weather being clear and nearly calm, Mr. Hooper and myself observed a colouring in some light fleecy clouds, which formed one of the most beautiful phenomena that I had ever seen. These clouds, which were small and white, and almost the only ones in the heavens, assumed, as they approached and passed under the sun, the most soft and exquisite tints of light lake, bluish green, and yellow about their edges that can possibly be imagined. These tints appeared only when the clouds were within  $15^\circ$  or  $20^\circ$  of the sun, were brightest as they passed under it, which they did as close as  $2^\circ$ , and began to be again indistinct at  $10^\circ$  from it. Some of the clouds remained coloured in this way for upwards of a quarter of an hour. There did not seem to be any regular arrangement of tints, as in the prismatic spectrum, but the lake was always next the sun."

On April 27th, and again on 28th, there was fog "such as occurs in more temperate climates."

On April 29th, at 2.30 p.m., the clouds were coloured in the same beautiful and delicate manner as on the 16th, except that the tints were now not so vivid, the clouds passing further from the sun.

On May 3rd "the clouds had a tendency to form two distinct arches across the heavens from N.N.E. to S.S.W., joining at the horizon, but separating gradually on each side of the zenith to the distance of  $8^\circ$  or  $10^\circ$  from each other."

#### PARHELIA, &c.

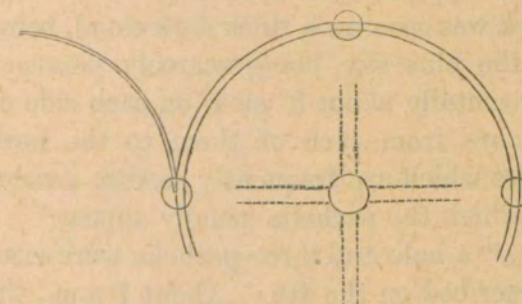
October 21st, 2 to 3 p.m., the weather being "clear and fine, and the sun near the horizon, a parhelion, strongly prismatic, was seen on each side of it at the distance of  $23^\circ$ , resembling the legs of a rainbow resting upon the land."

November 28th. "Soon after the moon rose this afternoon, it was curiously deformed by refraction, the lower edges of its disc appearing indented with deep notches, and at other times seeming to be cut off square at the bottom. A single

ray, or rather a column of light, of the same diameter as the moon, was also observed to descend from it to the top of the hill, like a pillar supporting it."

December 1st, 6.30 p.m., "part of a circular halo, whose radius was  $22^\circ 52'$ , was observed round the moon, which was near the full. Part of a well-defined horizontal circle of white light, passing through the moon, extended also for several degrees on each side of her, and in the points where this circle intersected the halo, were two prismatic spots of light or paraselenæ. In that part of the halo which was immediately over the moon, was another spot much brighter; and opposite to it, in the lower part of the circle, another similar, but much more faint. About the same time, on the following evening, two concentric circles were observed round the moon, the radius of the smaller being  $38^\circ$ , and of the larger  $46^\circ$ . Upon the inner circle were four paraselenæ, strongly prismatic, situated with respect to the moon as on the preceding day, and there was also a faint horizontal circle of white light passing through the moon as before. The weather was fine in both these instances, but there was still a sort of haziness in the atmosphere which prevented the heavenly bodies being very distinctly seen."

January 1st, 10 a.m., "a halo, whose radius was  $22^\circ 30'$ , with three paraselenæ, which were very luminous, but not tinged with the prismatic colours, was seen about the moon, similar to that described on December 1st; and on the following day the same phenomenon occurred, with the addition of a vertical stripe of white light proceeding from the upper and lower limbs of the moon, and forming with a part of the horizontal circle seen before, the appearance of a cross as shown in the accompanying diagram. There was also at times an arc of another circle touching the



halo, which sometimes reached almost to the zenith, and changed the intensity of its light very frequently, not unlike the aurora."

"On the morning of the 4th a cross appeared about the moon, consisting of vertical and horizontal rays of white light, similar to those described on the 2nd, but unaccompanied by any halo."

On 26th, 10.30 p.m., "a complete halo of pale light was observed round the moon, its radius being  $22^\circ 40'$ , and a similar phenomenon occurred on the following night about the same time. These phenomena almost always began to make their appearance about the time of full moon."



February 7th, noon, an indistinct parhelion, slightly prismatic, east of the sun, at a distance of  $22^\circ$ .

February 13th. "For a short time before and after noon, a parhelion was seen at the angular distance of  $22^\circ 30'$  on each side of the sun, at the same altitude with the latter; these parhelia were of a confused shape, but strongly prismatic. There was at the same time, also a column of bright yellow light proceeding from the sun to the horizon, of the same diameter as that object."

March 2nd, 9 a.m., "a parhelion appeared on each side of the sun, at the angular distance of  $21^\circ 3'$ , that on the eastern side being bright and prismatic, the other indistinct at first, but becoming as clear as the other as the sun rose higher. They were not seen after 10 o'clock until 1.30 p.m., when they reappeared for a short time at the distance of  $22^\circ$ ."

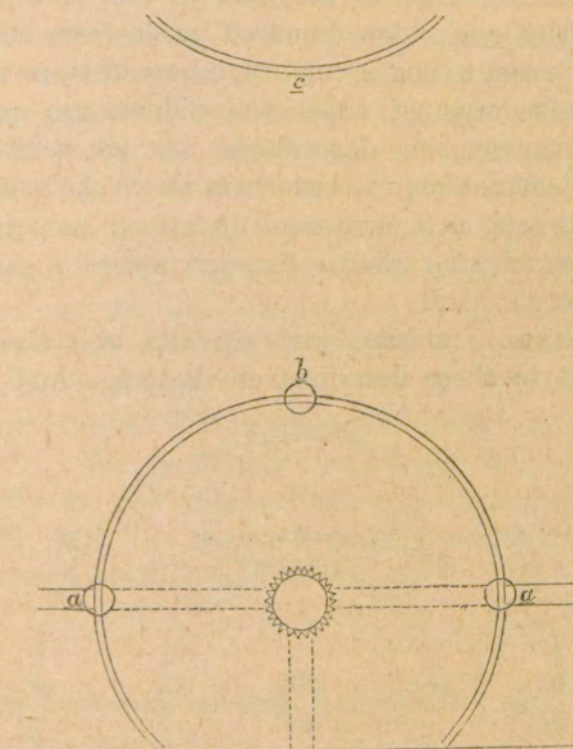
March 4th, 11.30 a.m., "a halo appeared round the sun, at the distance of  $22^\circ 17'$  from it, consisting of a circle nearly complete, and strongly prismatic. Three parhelia or mock suns, were distinctly seen upon this circle, the first being directly over the sun, and one on each side of it, at its own altitude. The prismatic tints were much more brilliant in the parhelia than in any other part of the circle; but red, yellow, and blue were the only colours which could be traced, the first of these being invariably next the sun in all the phenomena of this kind which came under our observation. From the sun itself several rays of white light, continuous but not very brilliant, extended in various directions beyond the halo, and these rays were more bright after they had passed through the circle than they were in the part within it; this phenomenon continued for nearly two hours."

March 5th. "A parhelion appeared on each side of the sun at the same altitude; that to the westward, which was seen on a thick dark cloud, being bright and prismatic; the other, appearing on the blue sky, being scarcely perceptible. A ray of bright yellow light extended horizontally about  $3^\circ$  or  $4^\circ$  on each side of the parhelia, and also a stripe of prismatic colours from each of them to the horizon. Both these were probably parts of the circles which are frequently seen to accompany these phenomena, and at the intersection of which the parhelia usually appear."

March 8th, 10 to 11 a.m., "a halo and three parhelia were seen about the sun in every respect similar to those described on the 4th. About 1 p.m., there being a fresh breeze from the northward, with some snow-drift, the parhelia reappeared, being much more bright and prismatic than in the forenoon, and accompanied by the usual halo, which was nearly complete, and whose radius measured  $22\frac{1}{2}^\circ$ . The parhelia *a, a*, in the annexed figure, on each side of the sun, were at times so bright as to be painful to the eye in looking steadfastly at them. When they were brightest the light was nearly white, and this generally occurred when the wind was most moderate, and when there was consequently less snow-drift. When, on the other hand, the wind and drift increased, they became of a deeper tint, but the red and a pale yellow were the only distinguishable colours, the former being as usual next the sun. These parhelia were

much better resemblances of the sun than any we had seen before, being smaller, more compact, and circular, and better defined about their edges than usual, approaching in every respect, nearer to that appearance of the sun's disk, which has obtained for them the name of mock-suns. The parhelion *b*, over the sun, was never very bright, and the circle of the halo was but faintly tinged with the prismatic colours. Part of a horizontal circle of pale white light passed through the sun's disk, and across the two lower parhelia, being much more bright without than within them. By looking at the sun through a coloured glass, a column of light was seen under it, as often observed before. The brightness of the whole phenomenon varied every instant on account of snow-drift.

"When this phenomenon had continued about an hour and a half, we perceived a segment of another circle above the first, and inverted with regard to it, as at *c*, its centre being somewhere near the zenith.



"The distance from the sun to *c* was about  $54^\circ$ , as nearly as the indistinctness of the latter would allow of its being measured. The whole disappeared in two hours and a half from its commencement, during which time the thermometer was from  $-16^\circ$  to  $-20^\circ$ , and the weather fine and clear overhead."

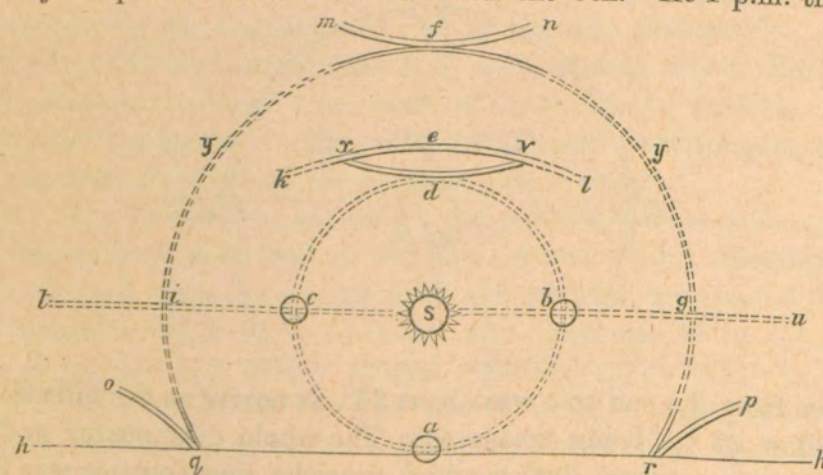
March 14th, 5 p.m., "a parhelion was observed on each side of the sun, at its own altitude, and distant from it  $22^\circ 10'$  with a part of the usual horizontal circle, extending  $2^\circ$  or  $3^\circ$  from the outer edge of each parhelion."



"April 1st. In the evening a parhelion was seen on each side of the sun, and a third above it, as usual, at the angular distance of  $22^{\circ} 20'$ , the two first being strongly marked by the prismatic colours, and the other very indistinctly."

April 5th, 9 a.m., "the weather being very fine, and the thermometer at  $-18^{\circ}$ , we observed a halo round the sun, which was at times nearly complete. There was, as usual, a parhelion on each side of the sun, at the same altitude, and distinctly prismatic. There was also a third parhelion in that part of the circle immediately above the sun, and this had a peculiarity attending it which we had never before observed. Although the weather was remarkably fine and clear, the atmosphere was full of innumerable minute *spiculæ* of snow glittering in the sun, which we had never before seen on a bright sun-shiny day, though we had constant occasion to remark such a deposit, at times when the weather could by no means be called hazy, and when the heavenly bodies were distinctly visible. The parhelion above the sun appeared to be evidently formed by the reflection of the sun's rays to the eye, by an infinite number of these *spiculæ*, commencing close to the observer, and continuing so as to be easily distinguishable for at least one or two hundred yards from the eye. This parhelion might at times be easily seen to consist of the intersection, or rather the touching, of two circles turning opposite ways, of which the plainest was generally the upper one, or that which had its convex side downwards. At about  $22^{\circ}$  above the parhelion, being nearly the same distance that the latter was above the sun, a streak of glittering *spiculæ* was permanently seen in a horizontal direction; but there was so little of it that it was difficult to say of what regular figure it formed a part. This phenomenon continued above an hour."

April 9th, 6.30 to 8 a.m., "a halo, with parhelia, was observed about the sun, similar in every respect to those described on the 5th. At 1 p.m. these phenomena



reappeared, together with several others of the same nature, which, with Captain Sabine's assistance, I have endeavoured to delineate in the annexed figure.

*s*, the sun, its altitude being about  $23^{\circ}$ ; *h h*, the horizon; *t u*, a complete horizontal circle of white light passing through the sun.

*a*, a very bright and dazzling parhelion, not prismatic.

*b, c*, prismatic parhelia at the intersection of a circle, *a, b, c, d*, whose radius was  $22\frac{1}{2}^{\circ}$  with the horizontal circle, *t u*.

*x, d, v*, an arch of an inverted circle having its centre apparently about the zenith. This arch was very strongly tinted with the prismatic colours.

*k, e, l*, an arch apparently elliptical rather than circular, *e* being distant from the sun  $26^{\circ}$ ; the part included between *x* and *v* was prismatic, the rest white.

The space included between the two prismatic arches, *x, e, v, d*, was made extremely brilliant by the reflection of the sun's rays from innumerable minute *spiculæ* of snow floating in the atmosphere.

*q, f, r*, a circle having a radius from the sun of  $45^{\circ}$ , strongly prismatic about the points *f, q, r*, and faintly so all round.

*m, n*, a small arch of an inverted circle, strongly prismatic, and having its centre apparently in the zenith.

*r, p; q, o*, arches of large circles, very strongly prismatic, which could only be traced to *p* and *o*, but on that part of the horizontal circle *t u*, which was directly opposite to the sun, there appeared a confused white light, which had occasionally the appearance of being caused by the intersection of large arches coinciding with a prolongation of *r, p* and *q, o*.

The above phenomenon continued during the greater part of the afternoon; but at 6 p.m. the distance between *d* and *e* increased considerably, and what before appeared an arch, *x, d, v*, now assumed the appearance given in fig. 12, Plate 287, of Brewster's *Encyclopædia* resembling horns, and so described in the article "Halo" of that work. At  $90^{\circ}$  from the sun, on each side of it, and at an altitude of  $30^{\circ}$  to  $50^{\circ}$ , there now appeared also a very faint arch of white light, which sometimes seemed to form a part of the circles *q o, r p*, and sometimes we thought they turned the opposite way. In the outer large circle we now observed two opposite and corresponding spots, *y y*, more strongly prismatic than the rest, and the inverted arch *m, f, n*, was now much larger than before, and resembled a beautiful rainbow."

April 29th, 2.30 p.m., a parhelion on each side of the sun horizontally; both were faint and quite white.

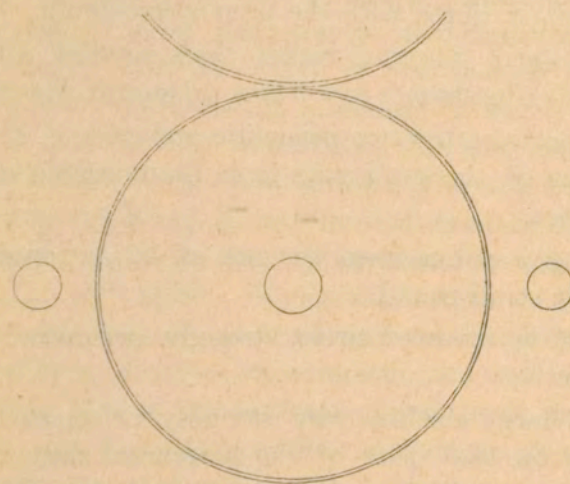
May 3rd, 10 p.m., a parhelion on each side of the sun, at the usual distance, slightly tinged with the prismatic colours.

May 10th, 9.30 a.m., "a halo round the sun consisting of a complete circle, and an arch of another, touching the first in the part immediately above the sun, and having its centre apparently from  $40^{\circ}$  to  $50^{\circ}$  from that object. There were two parhelia, faintly prismatic as usual, but about  $3^{\circ}$  without the circle.

"This phenomenon was remarkable on account of the parhelia not being situated upon the halo, as was usually the case. It now occurred to me that on the preceding



day, when the same phenomenon had been faintly seen, Mr. Nias, whom I directed to measure the angular distance between the parhelia and the sun, had reported it to be  $24^{\circ} 40'$ , the radius of the halo being  $22\frac{1}{2}^{\circ}$  as usual. This I considered to have been an



unavoidable error in the measurement of an ill-defined object; but on repeating it his first report was found to be correct."

May 16th. "The exhalations arising from the earth were about this time observed to be very abundant, producing, during the daytime, much of that appearance of waving tremulous motion in distant objects, which the French call *mirage*, and which was usually succeeded by a fog at night, as soon as the atmosphere had become cool.

"During one of these fogs, at 4 a.m. on the 16th, the sky being perfectly clear in the zenith to  $30^{\circ}$  of altitude, whilst a dense haze rested on the land and ice, Captain Sabine observed 'a haze-bow of distinct and dazzling light, having its edges softened off and without any appearance of prismatic colouring. The legs of the bow rose out of a bluish haze, the colour of which somewhat resembled that of weak starch; not quite half a circle was complete; the middle of the arch was between  $22^{\circ}$  and  $23^{\circ}$  above the land, which is of little elevation, and the legs were  $71^{\circ}$  apart. The weather was nearly calm, and there had been a considerable deposition of frozen dew throughout the night. Similar phenomena were observed on the mornings of the 20th and 23rd, about the same hour."

June 7th, 5 p.m., "the weather being hazy, and a light shower of snow falling, a strongly prismatic rainbow appeared, a phenomenon of rare occurrence in these regions; it had, I believe, nothing about it different from those observed in other climates."

June 16th, 11.30 p.m. "a triple rainbow appeared, the outer arch being quite complete and strongly tinged with the prismatic colours; the second nearly perfect, and the inner one being only perceptible near its eastern leg."

## AURORÆ.

September 20th, midnight, faint aurora in S.S.W.

September 24th, 9 p.m., "a vivid flash of light exactly like lightning. There was at the same time, and during the greater part of the night, a permanent brightness in the northern quarter of the heavens, which was probably occasioned by the aurora."

October 15th, in evening, faint aurora, consisting of a stationary white light, in S.W. and near the horizon.

October 20th, 6 to 8 p.m., aurora "forming a broad arch of irregular white light, extending from N.N.W. to S.S.E., the centre of the arch being  $10^{\circ}$  to the eastward of the zenith. It was most bright near the southern horizon; and frequent but not vivid coruscations were seen shooting from its upper side, towards the zenith."

November 9th, in the evening, for nearly two hours, the aurora was seen, forming a long, low, irregular arch of light, extending from N. to S. in the western quarter of the heavens, its altitude at the centre being  $3^{\circ}$  or  $4^{\circ}$ .

November 12th, 6 p.m., "the aurora was seen in a broken irregular arch, about  $6^{\circ}$  high in the centre, extending from N.W. by N. to S. by W., from whence a few coruscations were now and then faintly emitted towards the zenith."

November 13th, 8 to 12 p.m., "aurora from S.W. to S.E., the brightest part being in the centre or due South."

November 15th. "In N.N.W. and S.S.E. some light transparent clouds, from which columns of light were thrown upwards, resembling the aurora; those to the S.E. being opposed to a very light sky, had a light brown appearance."

November 16th. "Aurora, consisting of a bright stationary light from S.S.W. to S. by E., and reaching from the horizon to the height of about  $6^{\circ}$  above it."

November 17th, 3 p.m., "clouds of a light brown colour were seen, diverging from a point near the horizon bearing S.W. by S., and shooting pencils of rays upwards at an angle of about  $45^{\circ}$  with the horizon. These rays, however, were not stationary as to their position, but were occasionally extended and contracted. From behind these, as it appeared to us, flashes of white light were repeatedly seen, which sometimes streamed across to the opposite horizon, some passing through the zenith, others at a considerable distance on each side of it. This phenomenon continued to display itself brilliantly for half an hour, and then became gradually fainter till it disappeared about 4 p.m. The sun at the time of the first appearance of this meteor was on nearly the same bearing, and about  $5^{\circ}$  below the horizon."

November 18th, at night, faint aurora in S.W.

November 26th, in the morning, aurora from S. to N.W., commencing at  $4^{\circ}$  or  $5^{\circ}$  of altitude and streaming towards the zenith.

December 14th "was beautifully serene and clear, and there was more redness in the southern sky about noon than there had been for many days before; the tints, indeed, might almost be called prismatic. At 6 p.m. the aurora was seen forming two concentric arches, passing from the western horizon on each side of the zenith to within



20° of the opposite horizon, resting on a dark cloud about 7° high, from behind which the light appeared to issue, and partially streaming from the cloud to the zenith . . . The appearance I have just described of the light seeming to issue from behind an obscure cloud, is a very common one; it is not always, however, easy to tell whether any cloud really exists, or whether the appearance is a deception arising from the vivid light of the aurora being contrasted with the darker colour of the sky near it."

December 17th, in the morning, stationary faint aurora from S.W. to W.S.W.

December 19th, "the weather being fine and clear, the aurora appeared frequently at different times of the day, generally from the S. to the W.N.W. quarters, and not very vivid. From 8 to 12 p.m., however, it became more brilliant, and broke out in every part of the heavens, being generally most bright from S.S.W. to S.W., where it had the appearance of emerging from behind a dark cloud, about 5° above the horizon. We could not, however, help feeling some disappointment in not having yet witnessed this beautiful phenomenon in any degree of perfection, which could be compared to that which occurs at Shetland, or in the Atlantic, about the same latitude as these islands."

December 20th. In the morning aurora in N.W. "It here resembled two small bright clouds, the one nearly touching the other, and being about 7° above the horizon. These remained quite stationary for half an hour, and then broke up into streams shooting rapidly towards the zenith."

January 8th, 5.30 p.m., "the aurora was seen forming a broken and irregular arch of white light, 10° to 12° high in the centre, extending from N. by W. round by W. to S.S.E., with occasional coruscation proceeding from it towards the zenith. It continued thus for an hour, and reappeared from 8 till 12 p.m. in a similar manner, making, however, but a poor display of this beautiful phenomenon."

January 11th. "Faint coruscations of the aurora were observed to dart with inconceivable rapidity across the heavens from W.N.W. to E.S.E., from horizon to horizon, and passing about 25° to the south of the zenith."

January 15th. "In the evening aurora forming a complete arch from N. to S., passing a little to the east of the zenith. After the arch had broken up towards the southern horizon, there was a pale light, apparently, as described by Captain Sabine, 'issuing from behind an obscure cloud at from 6° to 12° of altitude, extending more or less towards the east or west on different nights, and at different times of the same night, having no determined centre or point of bisection, the greater part, and even at times the whole of the luminous appearance being sometimes to the east and sometimes to the west of south, but rarely seen in the northern horizon or beyond the E. and W. points of the heavens. This corresponds with the aurora most commonly noticed in Britain, except that it is there as peculiar to the northern as here to the southern horizon, occasionally shooting upwards in rays and gleams of light. It was not distinguished by any unusual brilliancy or extent on this occasion, the splendid part of the phenomenon being detached and apparently quite distinct."

"The luminous arch had broken into irregular masses, streaming with much rapidity

in different directions, varying continually in shape and intensity, and extending themselves from N., by E., to S. If the surface of the heavens be supposed to be divided by a plane passing through the meridian, the aurora was confined, during the time I saw it to the eastern side of the plane, and was usually most vivid and in larger masses in the E.S.E. than elsewhere. Mr. Parry and I noticed to each other that where the aurora was very brilliant the stars seen through it were somewhat dimmed, though this remark is contrary to former experience.

"The distribution of light has been described as irregular and in constant change; the various masses, however, seemed to have a tendency to arrange themselves into two arches, one passing near the zenith, and a second about midway between the zenith and horizon, both having generally a north and south direction, but curving towards each other, so that their legs produced would complete an ellipse; these arches were as quickly dispersed as formed. At one time a part of the arch near the zenith was bent into convolutions, resembling those of a snake in motion, and undulating rapidly, an appearance which we had not before observed. The end towards the north was also bent like a shepherd's crook, which is not uncommon. It is difficult to compare the light produced by an aurora with that of the moon, because the shadows are rendered faint and indistinct by reason of the general diffusion of the aurora; but I should think the effect of the one now described, scarcely equal to that of the moon when a week old. The usual pale light of the aurora strongly resembles that produced by the combustion of phosphorus; a very slight tinge of red was noticed on this occasion, when the aurora was most vivid, but no other colours were visible. Soon after we returned on board the splendid part wholly disappeared, leaving only the ordinary light near the horizon; in other respects the night remained unchanged, but on the following day it blew a fresh gale from the N. and N.N.W.' This aurora had the appearance of being very near us, and we listened attentively for the sound which is said sometimes to accompany brilliant displays of this phenomenon, but neither on this nor on any other occasion, could any be distinguished. On the following day the aurora was repeatedly seen for an hour or two together, assuming the shape of a long low arch, from 3° to 12° high in the centre, extending from S. to N.W."

February 3rd, 6 p.m., aurora very faint, "in a horizontal line of white light, extending from S. to S.S.W., and about 5° above the horizon. From 9 to 11 p.m. it was again seen quite stationary, and very faint, from S.S.W. to W.N.W., at 3° or 4° of altitude."

February 8th., "at noon, and for half an hour after, an appearance presented itself in the heavens, which we had not before observed. A thin fleecy cloud of pale red colour, and shaped like part of an arch, commenced pretty strongly from the top of the land in the N.W., and ran more and more faintly to N.byW., beyond which it could no longer be traced; it was here 15° above the northern horizon. On looking for a continuation of it in the opposite quarter of the heavens, we perceived a larger portion of another and fainter arch of pale red or orange, commencing at the horizon in the E.byN., and extending to 60° of altitude in the N.N.E., so as evidently not to form a



part of the western arch. Captain Sabine afterwards observed the whole phenomenon to alter its position, the leg of the eastern arch shifting considerably more to the southward. In the evening the aurora was seen, forming a confused and irregular arch of white light, continually varying in brightness, about  $8^{\circ}$  high in the centre and extending from S.by E., round by the W., to N.N.W. From the upper part of this arch, coruscations occasionally shot upwards, and a few streamers now and then burst forth also from the horizon in the S.S.E.; these latter went nearly up to the zenith, while the rest were more faint, and did not reach so high. I am confident that Aldebaran and the Pleiades were very sensibly dimmed by the most vivid of the coruscations, which appeared in this respect not to differ from any thin vapour or cloud floating in the atmosphere. The gold-leaf of the electrometer, as well as the magnetic needle suspended in the observatory, was carefully attended to, but neither of them suffered any sensible disturbance."

February 10th, 6.15 p.m., "the aurora began to appear in the S. and S.W., in detached and not very brilliant pencils of rays darting upwards from near the horizon. Soon after, an arch of the usual broken and irregular kind appeared in the western quarter of the heavens, extending from N.W. to S., and being from  $5^{\circ}$  to  $8^{\circ}$  high in the centre. From the upper part of the arch proceeded a few faint coruscations, reaching to no great height. At 6.45 a second and better defined arch crossed over from S.E. to N.W. by N., passing on the northern side of the zenith, from which it was distant from  $10^{\circ}$  to  $15^{\circ}$  in the centre. This arch was very narrow, and seemed to be formed of two parts, each shooting with great rapidity from those parts where the legs stood, and joining in the centre. In a short time this second arch entirely disappeared, and the first became less brilliant. The phenomenon was then for some minutes confined to some bright pencils of rays in the S. and S.S.E., which were generally parallel to each other, but sometimes also diverged at an angle of about  $15^{\circ}$ . At 7.15 two long and narrow streams of light crossed over at  $35^{\circ}$  to  $40^{\circ}$  of altitude, on the western side of the zenith, from the N.W. by N., and S., points of the horizon; their upper ends did not quite meet in the centre, so as to complete an arch, but inclined to the shape of shepherd's crooks, as described on January 15th, and often remarked by former observers; but they were neither so brilliant nor so well defined as when we saw them before. About 7.45, as we were returning on board from the observatory, the low arch to the westward first described, and which had never altogether disappeared, increased considerably in brilliancy. It was still, however, so irregular as to appear in detached roundish clouds or blotches, from which the pencils, which shot upwards, appeared immediately to proceed. These pencils, which were infinitely varied both in length and breadth, were observed to have also a slow, though very sensible lateral motion from N. to S., and *vice versa*; and we remarked on one occasion that, when two of them met, and had the appearance of over-lapping, they produced, for about 15 seconds, the most intense degree of light we had yet seen from the aurora. The pencils appeared generally to travel bodily in one direction, but sometimes to widen out in both at the same time. We were decidedly of opinion that the fixed stars were very perceptibly dimmed by this phenomenon, which gradually disappeared by 9 o'clock."

February 11th, 8.30 p.m., aurora appeared for a short time, in an arch, very irregular, but at times very bright, from S.W. to S.S.E., at  $4^{\circ}$  to  $5^{\circ}$  above the horizon in the centre.

February 19th, 10.30 to 11.15 p.m., aurora was seen, as described by Lieutenant Beechey, "in bright coruscations, shooting principally from the S. by W. quarter, across the zenith, to N.N.E., and partially in every part of the heavens. The light, when most vivid, was of a pale yellow, at other times white, excepting to the southward, in which direction a dull red tinge was now and then perceptible. The coruscations had a tremulous waving motion, and most of them were crooked towards the E.N.E. The fresh gale which blew at the time from the N.N.E. appeared to have no effect on the aurora, which, as before observed, streamed directly to windward, and this with great velocity. The brighter part of this meteor dimmed whatever stars it passed over, even those of the first magnitude, and those of the second and third magnitude, so much as to render them scarcely visible."

March 4th. The aurora was seen faintly near the S.S.W. horizon for three or four hours before midnight.

March 9th, 9 to 12 p.m., the aurora appeared faintly in the horizon to the S., occasionally streaming towards the zenith in coruscations of pale white light.

TABLE I.  
MEAN TEMPERATURE OF THE AIR AT WINTER HARBOUR, MELVILLE ISLAND,  
H.M.S. "GRIPER," Year 1819-20.

Hour.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Year.
2 a.m.	- 21.4	- 4.1	- 21.6	- 23.0	- 30.6	- 32.8	- 21.4	- 14.6	+ 11.8	+ 33.5	+ 38.6	+ 30.3	- 1.0
4 "	- 21.3	4.0	21.7	23.5	31.1	32.9	20.7	13.9	12.0	33.8	39.4	30.5	- 0.9
6 "	- 21.5	3.8	21.3	23.2	31.3	33.2	20.4	12.2	13.4	35.0	41.3	31.2	- 0.2
8 "	- 22.0	3.1	20.8	22.9	31.8	32.8	19.1	9.2	15.3	36.2	42.6	32.8	+ 0.8
10 "	- 23.1	2.3	20.5	21.5	31.4	32.1	16.7	5.9	18.0	37.5	44.0	34.3	+ 2.2
Noon	- 23.7	1.5	20.5	21.0	31.5	31.3	14.7	3.7	20.2	38.6	45.2	35.2	+ 3.2
2 p.m.	- 23.5	1.0	19.8	20.7	30.7	31.1	14.1	1.3	21.4	38.4	45.9	34.7	+ 3.8
4 "	- 23.5	1.4	20.4	20.6	30.9	31.7	15.5	1.4	21.7	38.5	45.1	34.0	+ 3.4
6 "	- 23.1	2.9	20.3	20.8	31.3	32.5	17.1	4.2	20.7	37.8	44.6	33.2	+ 2.5
8 "	- 22.9	3.2	20.8	20.2	31.5	32.8	18.3	8.0	18.4	36.5	42.8	32.3	+ 1.5
10 "	- 22.6	3.0	21.0	20.6	31.5	33.1	19.6	11.2	15.4	35.1	40.5	31.5	+ 0.4
Midnight	- 21.6	3.6	21.9	21.4	31.8	33.3	20.5	13.0	13.4	33.6	39.4	31.0	- 0.5
Means	- 22.5	- 2.8	- 20.9	- 21.6	- 31.3	- 32.5	- 18.2	- 8.2	+ 16.8	+ 36.2	+ 42.4	+ 32.6	+ 1.3



TABLE II.

MONTHLY MEANS OF BAROMETER READINGS, also its EXTREME READINGS, together with the MEAN TEMPERATURE, the WIND and the WEATHER of the DAY, at WINTER HARBOUR, MELVILLE ISLAND, H.M.S. "HECLA."

Month.	Means.	Day.	Highest.	Temp.	Wind.	Weather.	Day.	Lowest.	Temp.	Wind.	Weather.	Range.
September 1819 -	inches. 29.90	3rd	inches. 30.42	+34.2	N.W. 1	b c	20th	inches. 29.36	+17.2	N.N.E. 6	m	inches. 1.06
October - "	.81	22nd	.32	-6.9	N. 2	c	5th	.10	+3.0	N.W.b.W.6	c	1.22
November - "	.94	6th	.32	14.1	" 4	b c	27th	.63	-18.4	W. 2	b c	0.69
December - "	29.86	30th	.75	39.0	" 2	"	26th	.10	16.2	N.W. 5	m	1.65
January 1820 -	30.08	16th	.77	37.1	N.N.E. 2	"	24th	.59	24.8	N.N.W.8	q	1.18
February - "	29.77	29th	.15	29.1	N.N.W.4	b	12th	.32	42.0	Calm	b	0.83
March - "	.80	28th	.26	-24.2	" 2	b c	6th	.00	2.5	S.S.E. 4	s	1.26
April - "	29.98	27th	.86	+0.1	V. 1	"	15th	.40	-7.3	E.S.E. 3	c	1.46
May - "	30.11	1st	.48	8.6	N. 7	c	29th	.25	+26.5	N.W. 9	o	1.23
June - "	29.82	19th	.13	37.7	" 5	"	30th	.50	43.7	S.S.W. 5	c	0.63
July - "	.67	9th	.01	43.6	S. 5	"	26th	.13	36.9	W.N.W.5	s r	0.88
August - "	29.73	17th	30.03	+31.8	W.S.W.1	b	9th	29.46	+34.8	W. 1	m	0.57
Year - -	29.87	April.	30.86	-	-	-	March.	29.00	-	-	-	1.86

TABLE III.

MONTHLY MEANS OF THE TEMPERATURE OF THE AIR, also its EXTREMES, together with the READING of the BAROMETER, the WIND and the WEATHER for the DAY, at WINTER HARBOUR, MELVILLE ISLAND, H.M.S. "HECLA."

Month.	Means.	Day.	Max.	Bar.	Wind.	Weather.	Day.	Min.	Bar.	Wind.	Weather.	Range.
September 1819 -	+22.5	3rd	+37	inches. 30.3	N.W. 1	b c	26th	-1	inches. 30.1	N.N.W.4	b c	38
October - "	-3.5	2nd	17	29.7	S.S.E. 2	"	29th	28	29.7	N. b. W.2	"	45
November - "	20.6	4th	6	30.1	V. 2	m	20th	47	30.0	N. 2	"	53
December - "	21.8	31st	+6	30.0	N.E. 6	"	30th	43	30.6	" 2	"	49
January 1820 -	30.1	1st	-2	29.8	S.S.E. 6	b	13th	47	30.2	W.N.W.2	"	45
February - "	32.2	1st	-17	29.8	S. b. E. 2	m	15th	50	29.7	N. 3	b	33
March - "	18.1	11th	+6	29.4	W. 5	"	1st	40	30.0	S. 1	"	46
April - "	-8.4	30th	32	30.5	N.W. 1	s	10th	32	29.7	N. 1	b c	64
May - "	+16.7	27th	47	29.9	S. 2	c	7th	-4	30.0	N.N.W.4	"	51
June - "	36.2	22nd	51	30.0	N. 4	"	7th	+28	29.5	" 4	m	23
July - "	42.4	17th	60	29.7	" 1	b	29th	+32	29.4	S.W. 5	h s	28
August - "	+32.7	13th	+45	29.8	V. 2	c	28th	+22	29.7	W.S.W.5	m	23
Year - -	+1.3	July.	+60	-	-	-	Feb.	-50	-	-	-	110

TABLE IV.

SUMMARY OF THE WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), at WINTER HARBOUR, MELVILLE ISLAND, H.M.S. "HECLA."

Months.	Total Observations.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
September - 1819.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October - -	-	-	-	-	-	-	-	-	-	1	5.0	-	-	-	-	1	2.0
November - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2.0
December - -	-	-	-	-	-	1	6.0	-	-	5	5.2	3	4.3	1	1.0	1	5.0
January - 1820.	-	-	-	-	-	-	-	-	-	2	2.0	1	4.0	1	1.0	1	6.0
February - -	-	-	-	-	-	1	1.0	-	-	1	2.0	-	-	1	2.0	-	-
March - -	-	-	-	-	-	-	-	-	-	-	-	1	1.0	-	-	1	4.0
April - -	-	-	-	-	-	1	5.0	-	-	2	5.0	2	2.0	1	1.0	-	-
May - -	-	-	-	-	-	1	4.0	-	-	1	4.0	1	5.0	-	-	-	-
June - -	-	-	-	-	-	-	-	-	-	1	1.0	1	4.0	3	2.0	1	2.0
July - -	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.0	2	1.0
August - -	-	-	-	-	-	-	-	1	6.0	1	1.0	2	3.5	-	-	-	-

(continued.)

Months.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		Calms.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
September - 1819.	-	-	-	-	4	2.7	1	5.0	2	5.0	3	5.3	3	2.3	3	4.7	1	1.0	-
October - -	-	-	1	4.0	3	5.7	-	-	4	4.5	2	5.0	1	5.0	10	3.2	1	1.0	-
November - -	-	-	-	-	1	2.0	-	-	1	2.0	-	-	2	3.0	8	3.2	2	1.5	1
December - -	-	-	2	2.0	1	1.0	-	-	1	1.0	2	4.0	5	3.2	4	3.2	1	1.0	-
January - 1820.	-	-	-	-	-	-	-	-	-	-	1	2.0	1	2.0	9	4.4	5	1.0	-
February - -	-	-	1	2.0	-	-	-	-	1	3.0	2	2.0	1	5.0	10	4.1	2	1.5	1
March - -	-	-	1	1.0	-	-	-	-	3	5.0	-	-	2	3.0	6	2.7	1	4.0	-
April - -	-	-	-	-	-	-	-	-	-	-	-	-	3	2.3	4	3.0	7	1.6	1
May - -	-	-	4	2.0	-	-	-	-	-	-	-	-	6	4.2	3	4.7	2	3.5	3
June - -	-	-	2	4.0	2	3.5	-	-	6	3.7	1	2.0	2	3.0	2	4.0	2	3.0	-
July - -	-	-	4	4.5	1	4.0	1	5.0	1	4.0	1	4.0	3	4.7	1	4.0	1	4.0	-
August - -	-	-	-	-	1	2.0	-	-	3	3.7	7	2.0	4	3.7	3	3.3	2	3.0	1



TABLE V.

WEATHER NOTATIONS AT WINTER HARBOUR, MELVILLE ISLAND, H.M.S. "HECLA."

Month.	b.	c.	o.	m.	f.	r.	s.	q.
September 1819 - -	2	10	18	7	—	—	10	4
October " - -	7	14	10	8	—	—	4	—
November " - -	9	7	14	12	—	—	2	6
December " - -	10	11	10	10	—	—	—	3
January 1820 - -	10	9	12	6	—	—	—	8
February " - -	10	6	13	7	—	—	—	7
March " - -	6	7	18	10	—	—	5	11
April " - -	11	10	9	1	—	—	7	5
May " - -	10	15	6	3	—	1*	1	2
June " - -	4	18	8	3	—	3	3	1
July " - -	5	14	12	1	—	5	4†	1
August " - -	3	14	14	9	3	1	7	2

\* May 29th, r h s, wind E. 4

† Hail twice, wind S.W. 4.

TABLE VI.

MEANS AND EXTREMES OF DAILY MEANS OF OBSERVATIONS ON THE TEMPERATURE OF THE SEA SURFACE, NEAR WINTER HARBOUR, MELVILLE ISLAND, H.M.S. "HECLA."

Month.	No. of Days.	Mean.	Highest.	Lowest.
September 1819 - -	20*	29° 1	32° 5	28° 3
October " - -	31	28° 1	29° 1	27° 5

\* 1st to 19th and 30th.

No. XVI.

Results of Meteorological Observations made at Winter Island.

H.M. SHIPS "FURY" AND "HECLA," under the command of Captain W. E. Parry, F.R.S., wintered at Winter Island in 1821-2. The island is ten miles and a half in length from N.W.byW. to S.E.byS., and its average breadth from eight to ten miles. It is low land. None of the hills much exceed 200 feet in elevation. Cape Fisher, the S.E. point, rises to 76 feet. The ships were frozen in, off this point, in latitude 66° 11' N., longitude 83° 10' W., at the beginning of October, and remained there till the end of June. The highest spring tide rises to 15 feet 8 inches, the lowest neap tide only to 3 feet 1 inch, and the mean time of high water on full and change days is 12h. 11m. The flood comes from the north, and runs at spring tides between two and three knots per hour.

Although the ships were only nine months at Winter Island, the meteorological results for a complete year are here brought together, as the most convenient mode of dealing with data for the other months, which were passed in the vicinity. August was passed in Fox's Channel and the Frozen Strait, within the parallels of 65½° and 66½° N., and September mostly at anchor in Five-hawser Bay and Safety Cove, in latitude 66° 32' and 66° 36' respectively. July 1822 was spent in navigating the east coast of Melville Peninsula. "During the winter there was generally more or less open water in the offing, producing near the horizon a dense frost-smoke. As late as December, and even January, there was no 'old ice' visible for many miles, the sea being then covered with a thin sheet of 'young ice,' the produce of a single day. On the shortest day there was three hours daylight for writing in the cabin and about five hours for convenient walking on shore. The ships were for the first time in the season after entering their winter quarters, enveloped in a fog on the 2nd of May. The dissolution of the snow proceeded rapidly in that month. On the 5th pools began to form by its melting, and on the 7th its average depth on the ice was 8 inches, being double its depth in March. The thermometers were, as usual, hung on the outside of the ships in the shade, and both registers are discussed,"\* the means of the two being here given.

The temperature of the air was noted every two hours and the height of the mercury in the barometer every four hours, but as the temperature of the barometer was not recorded, these observations are of very little value.

"It being desirable occasionally to register a thermometer at a distance from the influence of the ships, in order to compare it with the indications of that in common use on board, a post was set up on the ice, and two corresponding spirit thermometers

\* Sir John Richardson, *vide* Jour. of the Roy. Geog. Soc., 1839.



selected for that purpose. In making this selection we found on comparing ten thermometers (of which three were mercurial and seven of alcohol) a difference of no less than  $7\frac{1}{2}^{\circ}$  between them, their indications ranging between  $-22\cdot5$  and  $-30^{\circ}$ . Two which indicated the mean of the whole were taken for use. At higher temperatures the difference was found to be very inconsiderable.”—*Parry’s Journal, November 14th.*

A curious difference of temperature was found to exist according as the thermometer was to windward or leeward.

“On the morning of April the 8th, the thermometer was observed to fall from  $6^{\circ}$  to  $2^{\circ}$  immediately on a partial clearing of the atmosphere, and again to rise on its becoming overcast to  $10^{\circ}$ , the wind continuing the same both in direction and strength. It shifted in the evening to the eastward, accompanied by a fall of small snow, which continued the whole of the two following days. On the 11th a difference was observed in the indications of the two thermometers on the ice, the reverse of that which generally took place.

—					North Therm.	South Therm.
At Noon	-	-	-	-	$20^{\circ}$	$11^{\circ}$
„ 1 p.m.	-	-	-	-	23	13
„ 2 p.m.	-	-	-	-	$13\cdot5$	13

“The wind was light from the W.S.W. during this time, and though it blew rather on the south than on the north side of the post, this seemed by no means sufficient to account for the difference, as even a strong breeze does not usually produce such an effect on the thermometer in the shade, though very sensible to the feelings. There was no snow on either of the bulbs except a little which continued to fall, and the sun was peeping out at times during the interval. A similar difference was again noticed a day or two after.

—					North Therm.	South Therm.
h. m.						
At 0	15 p.m.	-	-	-	$30^{\circ}$	18
„ 0	30 „	-	-	-	24	21
„ 2	0 „	-	-	-	28	14
„ 6	0 „	-	-	-	0	4

“The wind was very light from the east and south-east, with small snow, and the weather quite overcast, except towards 6 p.m. For two hours in the forenoon, when the sun made an effort to appear, a parhelion, tinged with the prismatic colours, appeared on each side of it, and nearer to that object by 30' was a halo of  $22^{\circ} 35'$

radius, also coloured, the red tint being, as usual, next the sun. An instance or two of the parhelion being situated without the circle have been mentioned\* as occurring at Melville Island, but the phenomenon appears to be a rare one.”

“With a light southerly breeze to-day, April 23rd, the south thermometer stood at  $+12^{\circ}$ , and the north at  $+23^{\circ}$ . Besides the former instances of this difference which I have already mentioned, several other, though less striking ones, occurred in the course of the spring, for which a light breeze blowing on the thermometer did not seem satisfactorily to account.”

On January 5th Parry remarks: “We had hitherto found the thermometer on board stand  $2^{\circ}$  to  $5^{\circ}$  higher than that on the ice, owing to the warm atmosphere created by the fires. On the 5th, at noon, however, the difference amounted to  $9^{\circ}$ , that on board standing at  $-22^{\circ}$ , when the other indicated a temperature of  $-31^{\circ}$ . We did not know to what cause to attribute this, but two or three degrees may fairly be deducted on this account from the mean temperatures given in the meteorological abstract throughout the winter.” This abstract has furnished the material for the present discussion, with the exception of that for Table I. Parry states that the winter atmosphere of these regions is seldom free from snow, though the weather might very well be called clear, as may readily be seen by placing an instrument in the open air for an hour or two.

“The first day of 1822 was a very severe one in the open air, the thermometer being down to  $-22^{\circ}$ , and the wind blowing strong from the north-west. The effect of a breeze upon the feelings is well known to every person, even in comparatively temperate climates, but at low temperatures it becomes painful and almost insupportable. Thus with the thermometer at  $-55^{\circ}$ , and no wind stirring, the hands may remain uncovered for ten minutes or a quarter of an hour without inconvenience, while with a fresh breeze and the thermometer nearly as high as zero, few people can keep them exposed so long without considerable pain. A high wind also had great effect in occasioning a general decrease of temperature in most parts of the ships, not by its gaining admission into the inhabited apartments, but by favouring the rapid abstraction of heat from without.”

January 26th we flew a kite to the height of 379 feet (as obtained by geometrical measurement) with a Six’s register thermometer attached to it. This, after it had been up a quarter of an hour, indicated a minimum of  $-23\frac{3}{4}^{\circ}$ , the temperature upon the ice, by the same thermometer, tried before and after, being  $-24\frac{1}{2}^{\circ}$ .”

The thermometer rose gradually from  $-35^{\circ}$  on the morning of March 1st to  $-11^{\circ}$  at night, and on the following day it reached  $+2^{\circ}$ . This increase of temperature was accompanied by a change of wind from N.W., by S., to S.E.

March 7th. “To ascertain the thickness of the ice formed in the bay since the close of the last autumn, a hole was dug in a part where no separation had taken place since the commencement of the winter’s frost, and where in fact we had seen it commence. The thickness of the floe was here 4 feet 7 inches, being the produce of exactly five calendar months.”

\* Journal of the Voyage, 1819-20, p. 172. See also ante, p. 269, under date May 10th.



Captain F. Lyon, who commanded the "Hecla," in his journal of the voyage, makes the following interesting remarks under date 1821, December 31st:—

"As we had now seen the darkest, although not by many degrees the coldest, season of the year, it may not here be irrelevant to mention the beautiful appearance of the sky at this period. To describe the colours of these cloudless heavens would be impossible; but the delicacy and pureness of the various blended tints excelled anything I ever saw, even in Italy. The sun shines with a diminished lustre, so that it is possible to contemplate it without a painful feeling to the eyes, yet the blush colour which in severe frost always accompanies it, is, in my opinion, far more pleasing than the glittering borders which are so profusely seen on the clouds in warmer climates. The nights are no less lovely, in consequence of the clearness of the sky. The moon and stars shine with wonderful lustre, and almost persuade one to be pleased with the surrounding desolation. The aurora borealis does not appear affected by the brilliancy even of the full moon, but its light continues still the same. The first appearance of this phenomenon is generally in showers of falling rays, like those thrown from a rocket, although not so bright. These being in constant and agitated motion, have the appearance of trickling down the sky. Large masses of light succeeded next in order, alternating from a faint glow resembling the Milky Way, to the most vivid flashes, which stream and shoot in every direction, with the effect of sheet lightning, except that after the flash the aurora still continues to be seen. The sudden glare and rapid bursts of these wondrous showers of fire render it impossible to observe them without fancying that they produce a rushing sound; but I am confident that there is no actual noise attending these changes, and that the idea is erroneous. I frequently stood for hours together on the ice to ascertain this fact, at a distance from any noise but my own breathing, and thus I formed my opinion . . . . It is remarkable that whenever the weather is calm, the aurora has a tendency to form an arch at whatever position it may occupy in the heavens . . . . In stormy weather the northern lights fly with the rapidity of lightning, and with a corresponding wildness to the gale which is blowing, giving an indescribable air of magic to the whole scene."

Table I. gives the bi-hourly means of the temperature of the air. The results for the 11 months, August 1821 to June 1822, are due to Sir John Richardson (*vide* Journal of the Royal Geographical Society for 1839), and were deduced from the journals of both the "Fury" and the "Hecla"; those for July 1822 have been deduced from the "Hecla's" register which was lent by the Hydrographical Office. The mean temperature of the year was  $9^{\circ}\cdot9$ . The warmest month was August,  $36^{\circ}\cdot9$ ; the coldest February,  $-24^{\circ}$ ; so that the mean range was  $60^{\circ}\cdot9$ .

All the results, except those given in Table I., have been deduced from the meteorological abstracts of the "Fury's" register given in Parry's "*Journal of a Second Voyage for the Discovery of a North-west Passage, &c.*"

Table II. exhibits the mean monthly readings of the barometer and its extreme monthly readings, with mean temperature, wind, and weather of the day. The barometer observations have been used as read off, without any correction, hence they must be received with reserve. The highest readings of the barometer were attended

with clearer and drier weather than the lowest readings, and the winds were more persistently from N.W. with the former than with the latter; but no decided difference of temperature seems attributable to the extreme heights of the barometer. The extreme range of the barometer was  $1\cdot63$  inches, and a range of  $1\cdot61$  inches occurred in March.

Table III. exhibits the mean monthly temperature of the air with the maximum and minimum for each month, and the day's mean height of the barometer, also wind and weather. The highest temperature,  $54^{\circ}$ , was in July, though the "Hecla" recorded only  $47^{\circ}$ ; the lowest  $-38^{\circ}$  in January, giving for extreme range  $92^{\circ}$ .

Except in the short summer, the barometer was always higher with the lowest than with the highest temperatures, and the weather was clearer and drier; while, with the highest, the winds were generally from the eastward, or some direction different from the prevalent N.W.

Table IV. furnishes summaries in days of the winds referred to sixteen points, with their mean force. The words expressive of the wind's strength had to be converted into Beaufort's scale. This table may be considered as sufficiently accurate for a general knowledge of the distribution of winds in azimuth, their relative strength and frequency. The N.W. were the prevalent winds, especially in winter. Very few winds blew from the eastern semicircle during winter.

Table V. contains the monthly summaries of the daily weather, expressed in the Beaufort notation. It would seem that the air is clearest at midwinter, and most obscured at midsummer. Snow (or rain) fell on 68 days. Lightning and thunder occurred only on August 7th. Captain Lyon in his "Narrative of an Attempt to reach Repulse Bay," alluding to the fogs of this region, says that they do not resemble English fogs. "In the northern seas these vapours rarely rise to above a hundred feet from the sea, and a sky of most provoking brilliancy is frequently seen overhead. The view from the deck is bounded to about a hundred yards, and such is the rapid formation of the icicles on the rigging, that it is actually possible when the temperature is low to see them grow beneath the eye. Yet chilling as this may appear, the sudden clearing of the fog no sooner permits the sun to break forth in its full vigour, than the ship and the rigging glisten in the most brilliant manner as if they were of glass, and a rapid thaw quickly restores everything to its original colour."

Table VI. contains the results of observations on the temperature of the sea-surface water. They show that the maximum occurs in August.

When beset in and near Lyon Inlet, in September 1823, advantage was taken of the deep water to try its temperature at different depths, as shown in the following statement:—

These observations were made on September 3rd to 11th inclusive, and the mean temperature of the water brought up from the surface was $30^{\circ}\cdot4$ by 23 observations.				
From a depth of 100 fathoms	$30^{\circ}\cdot3$	"	3	"
" 105	" $29^{\circ}\cdot5$	"	1	"
" 106	" $29^{\circ}\cdot0$	"	1	"



From a depth of 108 fathoms 29°·6 by 1 observation-s.

"	110	"	29°·7	"	1	"
"	115	"	29°·5	"	2	"
"	120	"	29°·8	"	3	"
"	124	"	30°·2	"	1	"
"	125	"	30°·7	"	1	"
"	130	"	30°·0	"	1	"
"	135	"	30°·0	"	1	"
"	140	"	30°·5	"	2	"
"	150	"	30°·0	"	1	"
"	160	"	31°·4	"	1	"
"	170	"	30°·5	"	1	"
"	180	"	30°·0	"	1	"
"	200	"	30°·5	"	1	"

These observations make the water at from 105 to 120 fathoms about 1° colder than the surface water, and below this layer, down to 200 fathoms, about the same temperature as the surface.

TABLE I.

MEAN TEMPERATURE OF THE AIR AT AND NEAR WINTER ISLAND, H.M. SHIPS "HECLA" AND "FURY," Year 1821-22.

Hours.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Year.
2 a.m.	-	+34°·4	+30°·2	+11°·7	+7°·3	-14°·0	-23°·8	-25°·1	-13°·5	+2°·2	+14°·8	+28°·2	+7°·4
4 "	-	34°·8	30°·4	11°·6	7°·4	14°·2	23°·9	25°·0	13°·5	2°·1	16°·4	29°·2	7°·6
6 "	-	35°·4	30°·6	11°·9	7°·5	14°·1	23°·4	24°·8	13°·0	4°·0	20°·8	31°·1	8°·6
8 "	-	36°·6	31°·1	12°·7	7°·9	13°·9	22°·7	24°·4	11°·7	6°·3	23°·1	33°·9	9°·9
10 "	-	37°·8	32°·4	14°·1	8°·3	13°·4	22°·2	23°·1	9°·7	9°·7	26°·2	36°·2	11°·4
Noon	-	38°·6	33°·0	15°·1	8°·7	13°·6	21°·8	22°·0	7°·7	11°·5	29°·1	38°·3	12°·6
2 p.m.	-	39°·2	33°·0	15°·3	8°·6	13°·9	22°·1	21°·8	7°·0	11°·4	30°·1	37°·9	12°·6
4 "	-	38°·9	33°·0	14°·6	8°·5	14°·4	22°·8	22°·6	7°·7	10°·2	29°·8	36°·9	12°·0
6 "	-	38°·0	32°·4	14°·0	8°·0	14°·6	23°·4	23°·9	9°·7	8°·2	27°·3	34°·8	10°·8
8 "	-	36°·9	31°·9	13°·3	7°·7	14°·8	23°·8	24°·8	11°·1	5°·4	24°·1	32°·0	9°·5
10 "	-	36°·1	31°·0	12°·7	7°·5	15°·0	23°·9	25°·0	11°·6	3°·7	19°·8	30°·4	8°·5
Midnight	-	+35°·5	+30°·4	+11°·9	+7°·2	-15°·0	-24°·3	-25°·3	-12°·4	+3°·1	+17°·6	+29°·2	+7°·8
Means	-	+36°·9	+31°·6	+13°·2	+7°·9	-14°·2	-23°·2	-24°·0	-10°·7	+6°·5	+23°·3	+33°·2	+9°·9

TABLE II.  
MEANS AND EXTREMES OF BAROMETER READINGS, at and near WINTER ISLAND,  
H.M.S. "FURY."

Months.	Means.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Weather.	Range.
August 1821	inches. 29°·70	5th	inches. 30°·14	+38	S.S.W. 2	b c	8th	inches. 29°·32	+36	V'ble. 2	r f	inches. 0°·82
September "	·88	18th	·41	28	W.N.W. 4	c	6th	·40	36	S.S.E. 1	m	1°·01
October "	·72	16th	·14	3	N.N.W. 4	"	18th	·20	+19	S.W. 2	c	°·94
November "	·98	21st	·40	+9	N.N.E. 1	"	3rd	·28	-12	N.N.W. 5	q c	1°·12
December 1822	·76	14th	·12	-25	N.W. 2	b c	17th	·16	8	S.E. 5	c	°·96
January "	·79	23rd	·26	31	N.N.W. 4	b	26th	·42	26	N.N.W. 5	b	°·84
February "	·59	3rd	·04	29	" 2	b c	10th	28°·78	26	N.b.W. 2	m s	1°·26
March "	·69	26th	·41	-10	W.N.W. 4	"	15th	·80	12	N.N.W. 7	m	1°·61
April "	·74	13th	·10	+2	E. 2	"	1st	29°·05	-6	N.W. 4	c	1°·05
May "	·83	5th	·40	28	N.W. 2	c	16th	·30	+28	E.S.E. 4	m s	1°·10
June "	·72	10th	·00	30	" 4	"	30th	·10	31	N.N.E. 5	"	°·90
July "	·53	12th	29°·96	+40	S. 2	"	2nd	·05	+33	N.W.b.W. 5	c	°·91
Year -	29°·74	Sept. & March.	30°·41	—	—	—	Feb.	28°·78	—	—	—	1°·63

TABLE III.

MEANS AND EXTREMES OF THE TEMPERATURE OF AIR IN SHADE, at and near WINTER ISLAND, H.M.S. "FURY."

Months.	Means.	Date.	Highest.	Bar.	Wind.	Weather.	Date.	Lowest.	Bar.	Wind.	Weather.	Range.
August 1821	+36°·6	10th	+48	inches. 29°·6	W.N.W. 4	b c	22nd	+28	inches. 29°·9	N.b.E. 2	c	20
September "	31°·1	1st	42	·7	S.W. 1	"	28th	+20	·9	N.E.b.E. 4	"	22
October "	12°·5	1st	32	·4	E. 7	q r	22nd	-13	·9	N.W. 4	b	45
November "	+7°·7	12th	28	·8	" 4	m	28th	20	30°·0	" 5	"	48
December "	-12°·9	7th	+2	·8	E.S.E. 2	c	3rd	29	29°·9	" 4	"	31
January 1822	23°·0	11th	-6	·5	E. 4	m	21st	38	30°·1	" 4	"	32
February "	25°·0	15th	-4	·3	S.W. 7	"	19th	37	29°·5	" 4	b c	33
March "	-11°·6	9th	+13	·5	W. 5	"	1st	35	·8	W. 6	"	48
April "	+5°·5	27th	29	·5	S.E. 2	c s	16th	12	·6	W.N.W. 2	"	41
May "	23°·1	24th	46	·4	N.E. 2	"	1st	-5	30°·0	N.W. 4	b	51
June "	34°·0	18th	50	·7	E.S.E. 2	f	7th	+20	29°·6	S.S.W. 2	c	30
July "	36°·3	7th	54	·7	N.W. 4	c	17th	+30	·2	V'ble. 2	m	24
Year -	+9°·5	July.	+54	—	—	—	Jan.	-38	—	—	—	92



TABLE IV.

SUMMARY OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), at and near WINTER ISLAND, H.M.S. "FURY."

Month.	No. of Days.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
August 1821.	31	1	3.0	1	3.0	2	2.0	1	2.0	—	—	—	—	1	2.0	1	2.0
September	30	1	3.0	1	2.0	1	2.0	1	4.0	2	6.0	3	3.7	2	2.5	1	1.0
October	31	7	4.0	6	3.6	2	3.5	—	—	2	6.0	2	3.0	2	5.5	—	—
November	30	6	3.5	5	3.0	1	7.0	2	4.5	1	4.0	—	—	1	4.0	—	—
December	31	5	2.4	—	—	—	—	—	—	—	—	1	2.0	5	4.4	—	—
January 1822.	31	3	2.0	—	—	2	3.5	—	—	2	3.0	—	—	—	—	—	—
February	28	4	3.0	1	2.0	—	—	—	—	—	—	—	—	—	—	—	—
March	31	4	3.2	3	6.0	—	—	—	—	—	—	1	7.0	—	—	—	—
April	30	4	2.0	1	2.0	1	2.0	2	4.5	2	3.0	1	2.0	1	2.0	1	5.0
May	31	2	4.5	2	3.5	4	3.2	—	—	—	—	1	4.0	1	4.0	—	—
June	30	3	3.3	2	5.0	—	—	2	3.0	1	4.0	4	2.0	3	2.7	—	—
July	31	3	2.7	3	3.3	2	2.0	—	—	1	2.0	2	4.5	2	3.0	—	—

(continued.)

Month.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		Calms.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
August 1821.	2	3.5	3	2.5	3	3.0	2	3.0	3	2.5	6	3.0	2	3.0	2	2.5	1	2.0	—
September	4	3.0	3	4.0	—	—	—	—	2	3.5	2	3.0	3	3.0	3	3.7	—	—	1
October	—	—	—	—	2	3.5	—	—	—	—	1	5.0	2	4.0	5	3.8	—	—	—
November	1	2.0	—	—	2	3.0	—	—	3	6.0	1	4.0	5	3.6	2	4.5	—	—	—
December	—	—	1	5.0	—	—	—	—	—	—	2	4.5	12	3.0	5	3.4	—	—	—
January 1822.	—	—	—	—	—	—	—	—	3	3.0	5	3.6	9	3.6	7	3.0	—	—	—
February	—	—	—	—	1	7.0	—	—	—	—	1	2.0	12	3.6	9	3.0	—	—	—
March	—	—	—	—	2	6.0	1	5.0	2	5.5	6	3.2	9	3.3	3	3.7	—	—	—
April	1	2.0	—	—	3	3.7	1	2.0	2	3.0	2	2.0	3	2.7	3	4.0	2	2.0	—
May	—	—	—	—	1	4.0	1	2.0	3	2.0	2	2.0	6	3.0	7	3.1	1	2.0	—
June	—	—	1	2.0	3	2.0	—	—	3	4.0	—	—	6	3.3	—	—	2	2.0	—
July	5	3.2	—	—	—	—	—	—	1	1.0	2	3.5	6	4.5	2	3.0	2	3.0	—

TABLE V.

SUMMARY OF WEATHER, at and near WINTER ISLAND, H.M.S. "FURY."

Month.		b.	c.	o.	m.	f.	r.	s.
August 1821	-	9	15	7	5	2	4	3
September	"	4	13	13	5	—	2	6
October	"	7	13	11	2	—	1	7
November	"	4	20	6	2	—	—	3
December	"	11	16	4	—	—	—	1
January 1822	-	15	10	6	3	—	—	2
February	"	7	12	9	7	—	—	1
March	"	9	10	12	9	—	—	3
April	"	3	11	16	5	—	—	13
May	"	10	14	7	3	—	—	5
June	"	2	19	9	7	2	4	3
July	"	3	18	10	8	—	6	5

August 7th Parry's abstract states "hazy and rain, some thunder and lightning"; the text reads, "In the evening the sky became overcast the wind being southerly, and between 11 p.m. and midnight several vivid flashes of lightning were seen to the westward and succeeded by hard rain for some hours." The ships were then in latitude 65° 30' N., longitude 82° W.

TABLE VI.

MEANS AND EXTREMES OF DAILY MEAN TEMPERATURE OF THE SEA, at and near WINTER ISLAND, H.M.S. "FURY."

Month.		Mean.	Highest.	Lowest.
August 1821	-	32.2	36.2	30.2
September	"	32.0	34.3	28.9
October	"	29.2	31.1	27.7
July 1822	-	31.9	34.7	30.0



DESCRIPTION OF THE AURORA AND OTHER LUMINOUS METEORS OBSERVED AT WINTER ISLAND,  
extracted from Parry's "Journal of Second Voyage."

"During October 1821 the aurora borealis was occasionally seen, though with little brilliancy. From 10 p.m. till 12, 21st, it was visible from S.E. to S.W., but most bright in the latter direction. The light was principally stationary, but a few faint coruscations shot upwards from it now and then. During the same hours on the 23rd it was seen near the horizon from W. by N. to S.W., having a tendency to form an irregular arch  $4^{\circ}$  or  $5^{\circ}$  high in the centre. It was generally stationary, and at times tolerably bright, but upon the whole a poor display of this phenomenon."

"November 5th, 9 a.m., a parhelion appeared on each side of the sun, but very faint, and tinged only in a slight degree with the prismatic colours. At 9.30 a.m., 15th, the weather being rather cloudy, and a light breeze blowing from the southward, the electrometer was tried, and again at 9 p.m., 16th, at which time the aurora, consisting of a stationary white light near the horizon, was visible in the S. by E. quarter of the heavens, but in neither case was the gold-leaf in the slightest degree affected."

"From 10 a.m. till 2 p.m., 17th, a halo appeared round the sun, its radius being  $22^{\circ} 40'$ . At 8 p.m. the aurora was seen, consisting of a stationary light occupying a very small portion of the heavens in the S.E. by E. quarter, and close to the horizon, from which at times vivid flashes shot across the zenith nearly to the opposite horizon. After 10 p.m. the stationary light shifted more to the southward, and then gradually disappeared. At 10 p.m., 18th, the phenomenon assumed a similar appearance in the S. by W. quarter. On the evening of the 23rd the aurora made its appearance in the N.W., vivid coruscations shooting at times across the zenith to the opposite horizon. The gold-leaf of the electrometer was not perceptibly affected by it. On the morning of the 24th it was again faintly seen in irregular streams of white light extending from the western horizon to the zenith; for several hours the same night also this extraordinary phenomenon was visible from the S.E. round by S. to W., being principally confined to a space about  $5^{\circ}$  above the horizon. The magnetic needle which was attentively watched, was not at all affected by any of these phenomena. On the 26th, both in the morning and evening, the aurora again appeared from S.E. to S.W., the brightest part being about  $10^{\circ}$  above the horizon, and with pencils of rays shooting upwards towards the zenith. In almost every instance it is observable that the light, however irregularly disposed in other respects, has a tendency to assume an arch-like form; but I think a plane bisecting the arch would more generally have coincided with the true, than the magnetic, meridian in the phenomena we had here an opportunity of observing. This was particularly the case on 27th, at 6 a.m., when the aurora formed one broad continuous and well defined arch, its centre passing rather to the southward of the zenith, and its legs appearing to rest upon the horizon at E. and W. For several hours on the evening of the 28th it was seen in the S.E., with rays

darting rapidly up nearly as high as the zenith. There is almost always one stationary patch of light near the horizon, appearing as it were the source whence the shifting or variable part of the phenomenon proceeds. It will be seen from about this period how much more frequently the aurora seemed to issue from the S.E. quarter than from any other during the rest of the winter."

"At 6 p.m., December 5th, there was a halo round the moon, with a confused appearance of a paraselena on the lower part of it. This halo, as I have often observed with others, had the appearance of being oval, the vertical diameter seeming to be the longest; but on measuring them with a sextant the deception became evident."

"From 6 till 10 p.m., 11th, a halo appeared about the moon, with three paraselenæ, two at the sides and one above it. This halo varied in its degree of clearness as the haziness of the atmosphere became greater or less, and was sometimes a little tinged with colour. A more rare phenomenon than this was noticed at 7 a.m., 20th, by the officer of the watch, namely, that the moon in rising had assumed the appearance of two. On hearing this I went on deck, and saw an inverted image of the moon below and nearly touching that luminary, which was about half a degree high at the time, thus:

(

(

"Mr. Scallon told me that the image had at first been as distinct as the moon itself, and it was nearly so when I saw it. This phenomenon continued about five minutes, the barometer being  $29.48$ , and the thermometer  $20^{\circ}$ , with very clear weather at the time."

"The concluding month of this year presented more frequent as well as more brilliant displays of the aurora than we had noticed at an earlier period of the winter. On the evening of the 2nd we observed it constantly appearing, from 5 till 10 p.m., in one quarter of the heavens or another, but entirely confined to the southern side of the zenith. It consisted sometimes of luminous blotches or small clouds, at others of coruscations shooting upwards, and a stationary light always perceptible near the horizon from S.S.E. to S.W. The light was white or yellowish white, and the compass was not affected. On the evening of the 3rd it also appeared in little white spots, resembling the nebulae in the heavens, as viewed by a telescope, or the Milky-Way on a very clear night. I may here remark by the way that this last beautiful feature of the heavens very seldom appeared here, for notwithstanding the notion generally entertained of the extreme clearness of the atmosphere under a polar sky, we have always found the very reverse to be the fact. It is true, indeed, that with a northerly or westerly wind, the sky was generally what would be called clear; but there is scarcely one night in twenty when the heavenly bodies, if viewed through a telescope, do not appear surrounded with more or less haze. Indeed, it very seldom happens that a considerable deposition of minute snow may not be observed to take place, even in the clearest nights in these regions."



"At 11 p.m., 4th, the aurora was seen forming an arch, about  $5^{\circ}$  high in the centre and extending from S.S.W. to S.E."

"On the afternoon of the 14th the aurora began to show itself as soon as it was dark, consisting principally of rays shooting up from the horizon in the E. by N. towards the zenith, and sometimes passing through but very little beyond it, towards the opposite side of the heavens. Just before 10 p.m., however, a much finer display of this phenomenon presented itself than we had yet seen this season. There still remained a place near the horizon at E. by N., whence a bright light seemed constantly to issue, and if any part of the phenomenon could be said to continue uniformly the same it was the leg of a broadish arch in that point, which scarcely ever changed its place or the intensity of its light. The arch was at times completed, or thrown over to the W.S.W., being  $15^{\circ}$  high in the centre, and generally about  $2^{\circ}$  broad, though in this respect it was irregular and somewhat variable. The lower part of the arch was always well defined, the space under it appearing dark, as if a black cloud had been there, which however was not the case, as we saw the stars in it unobscured, except by the light of the aurora. The upper side of the arch was never well defined, but its light was gradually softened off, so as to mingle with the azure of the sky, and often sent up coruscations towards the zenith.

"Thus far description may give some faint idea of the brilliant and extraordinary phenomenon, because its figure here maintained some degree of regularity; but during the most splendid part of its continuance, it is I believe almost impossible to convey to the minds of others an adequate conception of the truth. It is with much diffidence, therefore, that I offer the following description, the only recommendation of which perhaps is that it was written immediately after witnessing this magnificent display.

"Innumerable streams or bands of white and yellowish light appeared to occupy the greater part of the heavens to the southward of the zenith, being much the brightest in the S.E. and E.S.E., from whence it had indeed often the appearance of emanating. Some of these streams of light were in right lines like rays, others crooked and waving in all sorts of irregular figures, and moving with inconceivable rapidity in various directions. Among these might frequently be observed those shorter collections or bundles of rays, which, moving with even greater velocity than the rest, have acquired the name of "merry dancers," which, if I understand aright the descriptions given of them by others, I do not think I ever saw before. In a short time the aurora extended itself over the zenith, about half-way down to the northern horizon, but no farther, as if there was something in that quarter of the heavens which it did not dare to approach. About this time, however, some long streamers shot up from the horizon in the N.W., which soon disappeared. While the light extended over part of the northern heavens, there were a number of rays assuming a circular or radiated form near the zenith, and appearing to have a common centre near that point, from which they all diverged. The light of which these were composed appeared to have inconceivably rapid motion in itself, though the form it assumed and the station it occupied in the heavens underwent little or no change for perhaps a minute or more. Suppose, for instance, a

stream of light to have occupied a space between any two of the stars, by which its position could be accurately noticed, the light appeared to pass constantly and instantaneously from one to another, as if, when a portion of the subtle fluid of which it is composed had made its escape and vanished at the end next one of the stars, a fresh supply was uninterruptedly furnished at the other. This effect is a common one with the aurora, and puts one in mind, as far as its motion alone is concerned, of a person holding a long ribbon by one end, and giving it an undulatory motion through its whole length, though its general position remains the same. One of the most striking of the various locomotive properties of the aurora is that which it often has laterally, by which I mean in the direction perpendicular to its length. This motion compared with the other is usually slow, though still very rapid in the "merry dancers," which seem to observe no law with regard to the rest of the phenomenon. When the streams or bands were crooked, the convolutions took place indifferently in all directions. The aurora did not continue long to the north of the zenith, but remained as high as that point for more than an hour, after which, on the moon rising, it became more and more faint, and at 11.30 p.m. was no longer visible.

"The colour of the light was most frequently yellowish-white, sometimes greenish, and once or twice a lilac tinge was remarked, when several strata, as it were, appeared to overlay each other, by very rapidly meeting, in which case the light was always increased in intensity. The electrometer was tried several times, and two of Kater's compasses exposed upon the ice during the continuance of this aurora, but neither was perceptibly affected by it. We listened attentively for any noise which might accompany it, but could hear none, but it was too cold to keep the ears uncovered very long at one time. The intensity of the light was something greater than that of the moon in her quarters. Of its dimming the stars there cannot, I think, be a doubt. We remarked it to be, in this respect, like drawing a gauze veil over the heavens in that part, the veil being most thick when two of the luminous sheets met and overlapped. This phenomenon had all the appearance of being full as many of the clouds commonly seen, but there were none of the latter to compare them with at the time. I may in conclusion remark that, notwithstanding the variety and changeableness displayed by this aurora, there was throughout a perceptible inclination in the various parts of it to form an irregular arch from E. by N. over to S.W. by W."

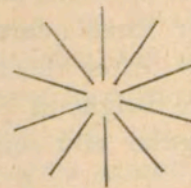
"From 7 to 10 p.m., 20th, while engaged in making observations upon the ice, we observed the aurora almost constantly appearing, though varying in its form and situation. It commenced with a number of vertical coruscations from the S.E., S., and N.W. horizons, darting nearly as high as the zenith. This being discontinued after half an hour, the leg of an arch appeared at E.S.E. inclining towards the south which remained nearly unaltered for three quarters of an hour, its light being of a yellow cast and remarkably brilliant. After this an arch was gradually formed by the light extending over to W.N.W., the brightest portion of it being still, that in the eastern quarter. The arch was irregular and sometimes not continuous, but divided



into a number of luminous patches like *nebulæ*. We also noticed, and now remembered to have done so once before, that there were in some places narrow but long horizontal separations of the light, appearing like so many dark parallel streaks lying over it, which however they were not, as the stars were here most plainly visible. The magnetic needle was not affected. This night was one of the clearest we had during the winter, the milky-way appearing unusually bright and well defined."

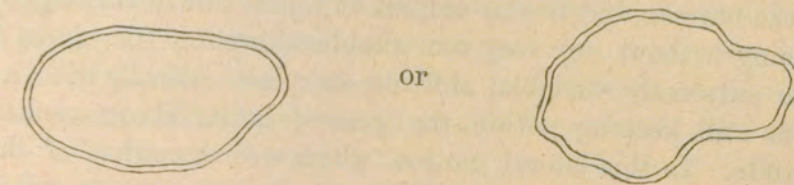
"In the evening, 22nd, the aurora appeared like a white cloud in the E.S.E. At half-past 9 an irregular arch extended from that point of the horizon to the S.W., the breadth being from one to two degrees, though constantly varying, and its height in the middle ten degrees. When this kind of arch appears most perfect, it is less frequently than any other kind attended with coruscations, or very rapid motion in the light. When these do accompany it, they are almost invariably observed to proceed from the upper side of the arch only. In the evening of the 23rd, though the wind was from the N.W., a number of small roundish clouds, very unusual here at this season, rose from the S.E., and the sky was very prettily illuminated in the intervals by the aurora. These clouds remaining quite dark in their appearance, except about their edges, even during the most brilliant display of the aurora, seemed to indicate that the latter phenomenon was the most distant of the two. The light of the aurora was, as usual, much the brightest in the S.E. quarter. This phenomenon again made its appearance very beautifully on the 24th, resembling in most particulars that described on 14th. It was principally confined to the southern half of the heavens, and the different streamers and coruscations, though almost infinitely varied, had an evident tendency to arch from E. by S. over to the opposite horizon. The "merry dancers" were also playing about with indescribable rapidity, and many of the sheets of light when they overlapped in meeting, had a very perceptible lilac tinge."

"On the morning of the 28th the aurora appeared faintly to the westward from 4 to 6 a.m. Early on the following morning it was observed to form an arch of very bright light from S.E. to S.S.W., its centre being  $30^\circ$  high. In its general form it was quite stationary, as indeed the more perfect arches usually are, but varied occasionally in the intensity of the light, and also in its continuity. From the time that the daylight began to leave the heavens in the afternoon, the aurora again appeared, commencing in the S.E. by E. with very long coruscations or streamers, which afterwards shot past the zenith over to the N.W. At 9 p.m. the light had become concentrated into a low arch,  $4^\circ$  high in the centre, well defined at the lower edge, but not so at the upper. The legs were at first situated in the E.S.E. and S.W. by W. quarters, but the former gradually shifted about two points more to the south. At



one time in the evening, and before the phenomenon had assumed the more regular arch-like form above mentioned, we observed for the space of a few minutes together the same radiated appearance about the zenith as that described on the 14th.

"This changed pretty suddenly into an irregularly circular band of light like a ribbon, thus:—



and then again returned to the radiated form, but neither of these appearances continued very long. There was a great deal of the lilac tint observable this evening, and the effect of the sheets of light in obscuring the stars was again too evident to admit a doubt."

"The appearances of the aurora during January were generally more distinguished for their frequency than their brilliancy, or for any extraordinary forms which this phenomenon presented. Towards midnight on 13th, the weather being clear, it appeared in a very bright arch from S. to N.E., being  $10^\circ$  to  $15^\circ$  higher in the centre. It afterwards assumed a wavy or serpentine form, which constantly varied, and smaller streams of light seemed to be continually meeting the larger, from near the zenith. From midnight till 2 a.m., 24th, it continued very bright and generally extended from E., where it was most brilliant to W.N.W. The following evening an arch of the aurora assumed the most perfect bridge-like form I ever saw. It extended from S.E. to N.W., on the southern side of the heavens, both its edges being well defined, which is very rarely the case. At 7 a.m. on the following morning it appeared again in a form still more novel, three complete arches being now visible; the middle one, which was the brightest, passing through the zenith, and the others, which were in the centre about  $20^\circ$  distant from it on each side, gradually closing till they joined it at the east and west points of the horizon. It was impossible not to be struck with the general resemblance in the form of this phenomenon to that I have frequently mentioned, as assumed by the clouds in the polar regions at particular seasons,\* this coincidence may possibly serve to throw some light on the nature and peculiarities of the aurora. For several hours on the same night this meteor formed a tolerably well-defined arch from E.S.E. to W.N.W., being  $6^\circ$  high in the centre, reaching from one horizon to the other and confined entirely to the southern side of the heavens. Early on the morning of the 16th it was seen for an hour and a quarter much in the same situation, and on the following evening it appeared faintly in almost every part of the heavens.

"From 11 p.m. till past midnight, 18th, it once more appeared very bright from W. to

\* Account of the Voyage of 1819-20, pp. 141, 144, 164.



S.E., having at times a very rapid and irregular motion. Whenever the light was most concentrated it was also the brightest, and almost always in that case we observed it to assume an arch-like form in the southern part of the heavens. This was particularly the case on the evening of the 19th, when there appeared two concentric though not altogether continuous arches, extending from S.E. by E. to W.S.W., the highest being  $8^{\circ}$  to  $10^{\circ}$  above the horizon, but in this respect at times slowly varying. At 11 p.m., after thus remaining without any very remarkable alteration for above two hours, it suddenly became extremely variable, shifting its place *laterally* with a prodigiously rapid motion, but still keeping within the general limits above mentioned, both in bearing and altitude. In this lateral motion, which was somewhat of the kind I have endeavoured to describe on December 14th, it seemed, as it were, to *roll* over from one end of the arch to the other, while at the same time numberless lighter and less brilliant coruscations were emitted from its upper margin. Whenever the phenomenon occupied the smallest space in the heavens, the light was invariably the most intense, and often when several sheets of it appeared to unite in the manner before explained, the lilac tint was quite vivid; in general its colour was yellowish. Stars of the second magnitude were almost obscured by it."

"Towards the end of January this phenomenon appeared frequently in the S.E. and E.S.E., but it was generally faint and unmarked by any peculiarity requiring further notice. The electrometer was frequently applied to the masthead chain, and the magnetic needle constantly watched during all these appearances, but neither of these was on any one occasion sensibly affected. The only other meteorological phenomena that need be noticed about this period were one or two instances of parhelia and paraselenæ, sometimes tinged with the prismatic tints, and sometimes colourless, but always situated at an angular distance of about  $22\frac{1}{2}^{\circ}$  on each side of the sun and moon, and usually upon halos, more or less distinct and perfect."

"The appearance of the aurora was less frequent during March than in the preceding winter months, in consequence of the increased duration of daylight at this period. Whatever slight variations might exist in these appearances, it still continued a matter of constant remark to us that the phenomenon almost invariably commenced in the south-eastern quarter of the heavens; and it is perhaps worthy of notice that the same thing was observed by Crantz in Greenland.\* The arch-like form assumed by the aurora was also one of its most invariable peculiarities, the legs of the arch being usually situated somewhere between the E. and W. points of the horizon, and almost always occupying the southern side of the heavens. The only instance of this phenomenon during the month of March deserving particular description occurred on the evening of the 30th, when it made its appearance as usual in the south-eastern horizon, from whence it soon diffused itself in a low but tolerably regular arch

\* See Crantz, i. 48, whose very words would truly describe what we so frequently noticed during this winter.

extending to the W.S.W. Again at times it altogether vanished, and then as suddenly reappeared much in the same situation as before. We often fancied that this phenomenon exhibited a light of greater actual intensity when the moon was above the horizon than at other times, though its appearance was of course less splendid on that account. Whether this was in reality the case or not, we had no means of correctly judging; but some idea of its brightness may be formed from the circumstance of its being often very distinctly visible when the moon was between her quarters and the full. The electrometer was tried during the continuance of this evening's aurora, but no effect was perceptible either on that or Kater's compass."

#### ON THE FREEZING-POINT OF DISTILLED MERCURY, AND AMALGAMS OF MERCURY.

"To determine the freezing-point of pure mercury, a portion of it was put into a shallow glass evaporating dish, and placed upon a support consisting of a slender rim of copper, with three glass legs. The bulbs of two spirit thermometers were placed upon each side of the dish, and the bulb of another in the centre of the mercury, the thermometer being attached to the stand, and in a vertical position. These thermometers had each been compared frequently with the standard mercurial one, when the temperature was not lower than  $-30^{\circ}$  Fahrenheit, and their respective errors applied at lower temperatures. The great difference between spirit thermometers at very low temperatures renders any dependence upon them, when accuracy is required, very precarious, without a comparison with the mercurial ones, a few degrees above the freezing point of mercury. Among eighteen spirit thermometers, frequently compared nearly at the same time, there was a difference often amounting to  $20^{\circ}$  at temperatures between  $40^{\circ}$  and  $50^{\circ}$  below zero; and, to show how much this was the case even in those made by the same maker, and of the same length and construction, the following is a comparison of ten of them. They were placed in parallel and vertical positions, upon a board fixed on two upright supports about three feet above the frozen sea, and each of them was freely suspended at the end of a nail. The temperature at the time of comparison had been very steady for a considerable time.

No. 1	-	-	-	$-56^{\circ}$	} Mean $-52^{\circ}\cdot4$ . Thermometer alcohol (uncoloured).
2	-	-	-	$-56$	
3	-	-	-	$-49$	
4	-	-	-	$-49$	
5	-	-	-	$-52$	
6	-	-	-	$-40$	} Mean $-42^{\circ}\cdot8$ . Thermometer alcohol (coloured).
7	-	-	-	$-40$	
8	-	-	-	$-44$	
9	-	-	-	$-44$	
10	-	-	-	$-46$	

"It appears from this comparison that there was nearly ten degrees difference between the means of the thermometers filled with the uncoloured alcohol and those



which were coloured, and the greatest difference is  $16^{\circ}$ . By a mean of several comparisons of the thermometers No. 5 and No. 10, between the temperatures of  $-26^{\circ}$  and  $-30^{\circ}$ , No. 5 was lower by  $2^{\circ} \cdot 2$ , and No. 10 was higher by  $4^{\circ}$  than a mean of seven mercurial ones; by applying these corrections the true temperature by No. 5 is  $-49^{\circ} \cdot 8$  and by No. 10 it is  $-50^{\circ}$  Fahrenheit, or a mean temperature of  $-49^{\circ} \cdot 9$  Fahrenheit. The temperatures as indicated by the thermometers with the uncoloured spirit, appear to be more correct than the coloured ones in which the power of contraction of the spirit appears rapidly to diminish and when suddenly taken from moderate to very low temperatures, most of the colouring matter was left in the upper part of the stem; they do not, therefore, seem so fit for use at very low temperatures as the others.

"By a great many observations made each winter, pure mercury begins to freeze at  $-38^{\circ} \cdot 5$  Fahrenheit. A watch glassful of it will be firmly frozen in about 3 or 4 hours when taken from a temperature of  $+32^{\circ}$  to  $-39^{\circ}$ , but it remains fluid at a steady temperature of  $-38^{\circ}$ . It begins to freeze first at the bottom and in the centre of glass, and generally assumes a kind of tree-shaped crystallization, or somewhat like the ribs and vertebræ of fish when arranged in parallel positions close to each other; but the crystals composing the mass are so ill-defined as to present no regular determination of figure, nor the least similarity between them.

"An amalgam of 200 grains of distilled mercury and 20 grains of lead was firmly frozen at  $-35^{\circ} \cdot 5$ , and fluid at  $-31^{\circ} \cdot 5$ .

"An amalgam of 100 grains of mercury and 3 grains of tin is firmly frozen at  $-35^{\circ} \cdot 5$ , and is fluid at  $-34^{\circ} \cdot 5$ .

"An amalgam of 200 grains of mercury and as much silver as it would dissolve was partly frozen after a considerable exposure to  $-35^{\circ} \cdot 5$ .

"An amalgam of 200 grains of mercury and 20 grains of zinc is partly frozen after a long exposure to  $-35^{\circ} \cdot 5$ .

"These mixtures were exposed in small thin glass cylinders at steady and natural temperatures, and the above are the nearest limits of the freezing points of each that could be obtained by this means. Nearer limits might probably have been obtained by varying the degree of cold by artificial means, but some uncertainty would have been introduced, arising from the difficulty of maintaining a uniform temperature by this means. The metals were obtained perfectly pure for the purpose of experiment before leaving England, and it appears that the amalgam of mercury and lead is most easily frozen."—*Appendix to Captain Parry's Journal of a Second Voyage, &c.*

## No. XVII.

## Results of Meteorological Observations made at Igloolik.

THE "FURY" AND "HECLA," commanded by Captain (afterwards Admiral Sir) W. E. Parry, cruised in the entrance of the strait which bears their names, from August 1st, 1882, varying their latitude little until September 19th, when they arrived at Igloolik, a small island lying a little south of the strait, in latitude  $69^{\circ} 21' N.$ , longitude  $81^{\circ} 53' W.$  The mean time of high water, on full and change days, is 7h. 28m. The highest spring tide rises 9 feet 8 inches and the lowest neap, 5 inches. "The ships remained shut up in the ice here till after the year of observation was completed. The upper limb of the sun was seen December 2nd, about one-sixteenth of its whole disc being visible from the 'Fury's' deck, over the low land to the southward. This was six days after it would have set, independent of refraction. The exact date of its reappearance in January could not be ascertained, owing to the sky being overcast for a fortnight after the 5th, on which day the sky was so red in the south at noon, that the sun was looked for from the mast-head, but without success. Its period of absence is probably about 38 days. About the summer solstice the sun was visible at midnight for 58 or 60 days, eight or ten of which are due to refraction, which at a low temperature amounts on the horizon to  $3^{\circ}$  or more.\* The snow continued to cover the land late in June, and on the 11th of that month travelling parties suffered severely from snow-blindness. This affection seldom appears after stones or patches of land have become visible. The ice on the lakes was at this time from 5 to 7 feet in thickness.†

The instruments were the same as those used at Winter Island during the previous year. Their errors are not known, but some estimate of the reliance which may be put upon the thermometrical results may be made from the following quotations from the "Journal of the Voyage."

November 23rd, thermometer reading,  $-38$ , "our mercury in the artificial horizons, being probably adulterated by lead from the troughs, froze into the form of branches of trees, extremely beautiful, and retaining all its brilliancy of surface."

"December 31st. Observing a considerable difference in the indications of some of

\* *Vide* Mr. Fisher's Papers on Solar and Terrestrial Refraction in the Appendix to Parry's Second Voyage.  
† Sir John Richardson, *vide* Journal Royal Geographical Society, 1839.



our spirit thermometers, 10 of these instruments were exposed to the atmosphere under exactly similar circumstances, when they were found to range from  $-35^{\circ}$  to  $-48^{\circ}$ , the two hitherto registered on board and on the ice, indicating from  $2^{\circ}$  to  $3^{\circ}$  higher than the mean of the whole number. The latter of these two was in future used for registering the temperature, and that on board altogether dispensed with, so that the degree of cold found in the meteorological abstracts during this winter will be from  $2^{\circ}$  to  $3^{\circ}$  less than the mean above alluded to. In estimating the mean temperature of the year, the same deduction may fairly be made during the other months, as a correction for the difference between the thermometer on board and that freely exposed at a distance from the ships. Five of these thermometers were of uncoloured spirit, with the scales graduated as low as  $-200^{\circ}$ , the rest were of alcohol coloured in the usual manner. By subsequent comparisons it appeared that at higher temperatures, especially above *zero*, the disagreement was much less between the same instruments."

Table I. contains the bi-hourly means of the temperature of the air for each month derived from the thermometrical register of the "Fury" and of the "Hecla" combined, and is due to Sir John Richardson (*Journal of the Royal Geographical Society*, 1839). The diurnal range was greatest in April,  $14^{\circ}$ , and less than  $2^{\circ}$  in November and December. July was the warmest month,  $39^{\circ} \cdot 1$ ; December the coldest,  $-28^{\circ} \cdot 2$ ; giving a range for the year of  $67^{\circ} \cdot 3$  on a mean of  $5^{\circ} \cdot 7$ . "The difference in the temperature of the day and night began to be sensible as early as the first week in March, and the daily range of the thermometer increased considerably from that time. The increase in the average temperature of the atmosphere, however, is extremely slow in these regions long after the sun has attained a considerable meridian altitude; but this is in some degree compensated by the inconceivable rapidity with which the days seem to lengthen when once the sun has reappeared. There is, indeed, no change which continues to excite so much surprise as that from almost constant darkness to constant day; and this is of course the more sudden and striking in proportion to the height of the latitude. Even in this comparatively low parallel the change seemed sufficiently remarkable; for soon after the middle of March, only ten weeks after the sun's reappearance above the horizon, a bright twilight appeared at midnight in the northern heavens."

The results contained in all the other tables have been deduced from the meteorological abstracts given in Parry's "Journal of a Second Voyage," &c.

Table II. exhibits the mean monthly readings of the barometer and its extreme monthly readings, with the temperature, wind, and weather of the day. The errors of the barometer not being known, and the temperature of an attached thermometer not having been recorded, no correction whatever has been made to the readings; hence they must only be considered of limited value. The highest reading,  $30 \cdot 84$  inches, occurred in March, the lowest,  $28 \cdot 68$ , in October, giving an extreme range of  $2 \cdot 16$

inches. On the whole the weather was clearer and wind lighter with the high than the low pressures.

Table III. exhibits the monthly means and extremes of the temperature of the air in the shade, accompanying the latter with the mean readings of the barometer, the wind and weather of the day. These means having been deduced from the register of the "Fury" only, differ somewhat from those in Table I. The highest temperature,  $59^{\circ}$ , was observed in July; the lowest,  $-45^{\circ}$ , in January, giving an absolute range of  $104^{\circ}$ . The lowest temperature has always the wind from N. to W. and clear weather. Easterly winds and hazy weather appear in relation to the highest temperatures. Indeed, Parry himself remarks: "In this as in every other part of the polar regions we have yet visited, a southerly or easterly wind occasioned a rise in the thermometer, while the greatest cold was always experienced with the wind in the opposite quarters."

Table IV. furnishes summaries in days of the winds referred to sixteen points, with their mean force. The words descriptive of the strength of wind have been converted into Beaufort's grades (scale 0 to 12). These results probably show with sufficient accuracy the distribution of winds in azimuth, their relative strength and frequency. The N.W. was the most prevalent; the S.S.W. was only recorded for one day.

Table V. contains monthly summaries of the daily weather, expressed in Beaufort's notation, from which it is at once apparent that the clearest weather occurred in winter, and the most cloudy and overcast in summer. There is also a tendency to fog in the summer. Snow or rain fell on 79 days, though very little from November to April inclusive.

Parry considered the winter a mild one for the latitude, and remarked, "the frequent occurrence of hard, well-defined cloud, a feature we had hitherto considered as almost unknown in the winter sky of the polar regions. It is not improbable that these may have in part owed their origin to a large extent of sea keeping open to the south-eastward throughout the winter, though they not only occurred with the wind from that quarter, but also with the colder weather usually accompanying north-westerly breezes. About the time of the sun's reappearance, and for a week or two after it, these clouds were not more a subject of admiration to us on account of their novelty, than from the glowing richness of the tints with which they were adorned. It is indeed scarcely possible for nature, in any climate, to produce a sky exhibiting greater splendour and richness of colouring than we at times experienced in the course of this spring. The edges of the clouds near the sun often presented a fiery or burnished appearance, while the opposite side of the heavens was distinguished by a deep purple about the horizon, gradually softening [upwards into a warm yet delicate rose-colour of inconceivable beauty."

April 8th. "We had frequently occasion to notice about this time that a copious deposit of snow-crystals, of a large size, and of a beautiful arborescent form, took place



every night, as soon as the temperature of the atmosphere fell some degrees below that of the day, just as the dew falls in temperate climates."

May 8th. "Accustomed as we had been to the rapidity of the changes produced by warmth when it does begin to operate in these climates, we still could not help being surprised at the alteration which a few days of temperate weather in the beginning of May effected in the appearance of the land, many of the ridges being almost entirely clear of snow, and every hour discovering some fresh spots of dark ground. The deception occasioned by one unvaried and extensive surface of white was now also once more perceptible, principally in making the neighbouring lands appear much nearer than before, and discovering the hills and valleys; whereas in the winter all was blended together, so as to give no idea of the true distance of the land or of its various undulations. Another change which we have invariably remarked to take place in the spring was now daily more and more observable; this consisted in the distinctness with which distant lands might be seen, or rather in those parts of the coast coming in sight which we had *never* seen during the winter. It is most certain indeed that, notwithstanding all that has been said of the superior transparency of the winter atmosphere in these regions, there is none less clear for viewing either celestial or terrestrial objects."

Table VI. contains the results of daily observations on the temperature of the sea-surface water during August and September.

At the entrance to and in the Strait of the "Fury" and "Hecla," the mean specific gravity of the sea-water at the surface was 1.02576, mean temperature of water when weighed 53°·3, observed 1822, August 1st, 4th, 7th, 26th, 27th.

*Earth Temperature.*—"February 4th we placed a Six's self registering thermometer in the ground near the observatory, 4 feet beneath the surface, the indices being set at + 8°. It would undoubtedly have been interesting to have ascertained the temperature of the earth during the winter, at a much greater depth than this; but, to give an idea of the difficulty of doing this, it will only be necessary to state that it occupied 27 days to effect what we did, and that at the expense of 10 pick-axes broken by digging. After the first 20 inches, where the soil was quite loose, the ground was literally frozen as hard as a rock, so that each blow of the pick-axe brought off only a few splinters accompanied by some white dust."

August 5th. "The register-thermometer, which had been placed in the ground in the winter, was taken up, though to our astonishment, the ground above and about it had become nearly as hard and compactly frozen as when we dug the hole to put it down. How this came about we were quite at a loss to determine; for the earth had been thrown in quite loosely, whereas its present consolidated state implied its having been thoroughly thawed and frozen again. It occupied two men 10 days to extricate it, which, as they approached the thermometer, was done by a chisel and mallet to

avoid injury by jarring. This, however, was not sufficient to prevent mischief, the instrument being so identified with frozen earth as to render it impossible to strike the ground near it without communicating the shock to the tubes, two of which were in consequence found to be broken. Thus ended our experiment for ascertaining the temperature of the earth during the winter, an experiment which it would seem, from this attempt, scarcely practicable to make in any satisfactory manner without some apparatus constructed expressly for the purpose."

TABLE I.  
MEAN TEMPERATURE OF THE AIR, near and at IGLOOLIK, Year 1822-3, H.M.S. "FURY."

Hours.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Year.
2 a.m.	+31.9	+23.4	+12.4	-18.4	-28.4	-17.0	-20.3	-22.7	-7.4	+18.5	+24.7	+34.8	+2.8
4 "	32.1	23.4	12.5	18.5	28.4	16.9	20.9	23.0	-7.5	19.7	25.8	35.6	3.0
6 "	32.7	23.7	12.8	18.3	28.3	16.5	21.0	22.8	-6.2	21.8	29.4	37.3	3.8
8 "	33.7	25.2	13.3	17.8	28.4	16.5	20.7	20.7	-2.0	25.2	32.9	40.4	5.5
10 "	34.8	26.3	15.1	17.8	27.5	15.9	18.7	16.8	+3.3	28.5	36.2	41.7	7.6
Noon	35.5	27.3	16.1	17.8	27.4	14.5	16.7	14.7	5.4	31.2	38.0	42.9	9.0
2 p.m.	36.0	27.3	15.5	17.9	27.6	14.4	16.7	12.5	6.5	31.6	38.5	43.1	9.3
4 "	36.1	26.8	14.8	18.4	28.2	15.2	18.6	13.7	5.6	30.4	37.8	42.3	8.5
6 "	34.8	25.7	13.9	19.8	28.4	16.2	19.6	17.3	+2.5	27.9	35.3	40.3	6.8
8 "	33.6	24.7	13.4	20.0	28.5	16.8	20.4	19.9	-1.2	24.9	33.1	38.3	5.3
10 "	32.8	23.8	12.5	19.9	28.6	16.9	20.6	21.5	-4.0	21.6	28.2	36.4	3.8
Midnight	+32.3	+23.4	+12.4	-19.5	-29.1	-16.5	-20.8	-22.6	-5.3	+20.3	+25.7	+35.5	+3.1
Means	+33.9	+25.1	+13.7	-18.6	-28.2	-16.1	-19.6	-19.0	-0.8	+25.1	+32.2	+39.1	+5.7



TABLE II.  
MEANS AND EXTREMES OF BAROMETER READINGS, near and at IGLOOLIK, H.M.S. "FURY."

Months.	Means.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Wea	Range.
August 1822	inches. 29.50	31st	inches. 29.82	+29.9	N.W. 4	c	29th	inches. 29.02	+30.4	N.W.b.N.2	m s	inches. .80
September "	.73	21st	30.02	25.9	S.E.b.E. 4	"	15th	29.45	24.2	N.N.W.2	"	.57
October "	.83	26th	.49	+5.9	V. 2	m s	13th	28.68	23.6	N.E.b.N.2	c s	1.81
November "	.71	8th	.17	-18.5	S.E. 2	m	9th	29.20	+1.5	E.S.E. 6	m s	.97
December "	.59	19th	.07	31.0	N.N.E. 4	b c	23rd	.07	-14.3	N.W. 2	b	1.00
January 1823	.75	26th	.52	-21.0	N. 2	"	28th	.05	3.4	N. 6	c	1.47
February "	29.84	4th	.52	+1.6	N.N.E. 2	c	16th	.32	40.5	N.W. 4	b c	1.20
March "	30.03	17th	.84	-18.6	N. 2	b c f	6th	.63	23.7	W. 8	m	1.21
April "	29.97	13th	.40	-8.1	W. 2	b c	5th	.50	-8.3	W.N.W.6	"	.90
May "	.91	9th	.47	+38.1	S.W. 2	c	16th	29.38	+21.3	N. 8	c	1.09
June "	.93	22n	30.52	35.3	N.b.W.2	b c	12th	28.96	25.7	N.N.W.6	m s	1.56
July "	29.53	13th	29.98	+38.9	S.E. 4	c	9th	28.90	+34.4	N.b.W.4	c r	1.08
Year -	29.78	March	30.84	—	—	—	Oct.	28.68	—	—	—	2.16

TABLE III.  
MEANS AND EXTREMES OF THE TEMPERATURE OF AIR IN SHADE, near and at IGLOOLIK, H.M.S. "FURY."

Months.	Means.	Date.	Highest.	Bar.	Wind.	Weather.	Date.	Lowest.	Bar.	Wind.	Weather.	Range.
August 1822	+33.7	3rd	+50	inches. 29.5	V. 1	b c	31st	+27	inches. 29.7	N.W. 4	c	23
September "	24.4	12th	37	.5	E.S.E. 2	m	18th	+11	29.7	W. 2	s	25
October "	+12.8	13th	29	.8	N.E.b.N.2	c s	23rd	-9	30.0	N.N.W.4	b	38
November "	-19.4	9th	+8	.3	E.S.E. 6	m s	24th	32	29.8	W. 2	"	40
December "	27.8	24th	-10	.2	W.S.W.2	"	31st	43	.7	" 2	b c	33
January 1823	17.1	15th	+22	.1	E.N.E. 6	"	3rd	45	.8	N.W. 2	b	67
February "	20.4	3rd	21	30.3	" 4	c	16th	43	.3	" 4	b c	64
March "	19.7	25th	4	29.9	W. 2	"	2nd	41	.7	W. 2	"	45
April "	-1.7	29th	32	.8	N.N.W.2	m s	15th	25	29.8	N.N.W.6	"	57
May "	+24.8	26th	49	.8	S. 2	m	1st	-8	30.0	W. 2	c	57
June "	32.2	30th	52	.5	N.W. 2	"	1st	+8	29.9	N. 2	"	44
July "	+40.0	19th	+59	29.6	S.E. 2	b c	2nd	+30	29.3	W. 6	"	29
Year -	+5.1	July	+59	—	—	—	Jan.	-45	—	—	—	104

TABLE IV.  
SUMMARY OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), near and at IGLOOLIK, H.M.S. "FURY."

Months.	Total Observations.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
August 1822.																	
August -	31	1	4.0	—	—	3	3.3	—	—	2	2.0	2	3.0	—	—	1	4.0
September -	30	1	4.0	—	—	—	—	4	3.5	—	—	2	2.0	3	3.7	2	6.0
October -	31	2	1.5	1	2.0	5	2.8	3	2.7	2	4.0	2	4.0	3	3.7	1	4.0
November -	30	1	2.0	—	—	—	—	—	—	1	6.0	—	—	1	2.0	—	—
December -	31	2	4.0	1	4.0	1	2.0	2	2.0	—	—	—	—	—	—	—	—
January 1823.																	
January -	31	7	2.7	—	—	1	2.0	3	5.3	—	—	—	—	2	3.0	1	4.0
February -	28	4	3.0	2	2.0	—	—	2	6.0	—	—	—	—	—	—	—	—
March -	31	6	2.0	—	—	1	4.0	—	—	—	—	—	—	—	—	—	—
April -	30	4	2.0	—	—	—	—	—	—	—	—	—	—	1	1.0	—	—
May -	31	2	6.0	1	6.0	3	4.7	—	—	—	—	2	5.0	3	4.0	1	4.0
June -	30	7	3.7	1	2.0	1	4.0	—	—	1	2.0	—	—	1	2.0	—	—
July -	31	3	2.7	1	4.0	1	2.0	—	—	1	1.0	1	4.0	10	2.8	3	4.0

(continued.)

Months.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		Calms.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
August 1822.																			
August -	1	4.0	—	—	2	2.5	—	—	3	3.0	6	3.5	5	2.6	3	3.3	2	1.5	—
September -	—	—	—	—	—	—	—	—	3	3.3	5	4.0	9	4.4	1	2.0	—	—	—
October -	2	4.0	—	—	—	—	—	—	—	—	—	—	7	4.7	2	3.0	1	2.0	—
November -	1	2.0	—	—	2	2.0	—	—	6	3.0	3	3.0	9	3.3	5	3.6	1	1.0	—
December -	—	—	1	2.0	—	—	1	2.0	11	2.4	—	—	8	3.2	4	2.5	—	—	—
January 1823.																			
January -	1	4.0	—	—	1	6.0	—	—	1	2.0	2	2.0	8	3.7	4	4.5	—	—	—
February -	—	—	—	—	—	—	—	—	2	4.0	2	3.0	12	3.3	3	2.0	1	1.0	—
March -	—	—	—	—	2	2.0	—	—	6	3.0	2	4.0	10	3.0	4	2.5	—	—	—
April -	1	4.0	—	—	—	—	3	2.0	3	3.3	1	6.0	9	5.3	8	3.5	—	—	—
May -	4	2.0	—	—	2	3.0	2	3.0	3	1.7	—	—	4	4.5	4	6.5	—	—	—
June -	2	5.0	—	—	3	2.0	—	—	2	2.0	1	2.0	5	2.0	6	4.0	—	—	—
July -	—	—	—	—	—	—	—	—	1	6.0	1	4.0	4	4.5	2	4.0	—	—	3



TABLE V.  
SUMMARY OF WEATHER, near and at IGLOOLIK, H.M.S. "FURY."

Month.				b.	c.	o.	m.	f.	r.	s.	q.
August	1822	-	-	3	17	11	8	3	8	4	—
September	"	-	-	3	14	13	8	—	—	10	—
October	"	-	-	7	9	15	7	—	—	13	—
November	"	-	-	16	8	6	5	—	—	2	—
December	"	-	-	17	8	6	6	—	—	2	—
January	1823	-	-	12	10	9	8	—	—	4	—
February	"	-	-	16	8	4	3	—	—	—	—
March	"	-	-	12	13	6	5	1	—	2	—
April	"	-	-	11	11	8	4	—	—	4	—
May	"	-	-	6	13	12	4	—	—	10	—
June	"	-	-	6	16	8	6	—	—	6	—
July	"	-	-	3	13	15	5	4	14	—	—

TABLE VI.  
MEANS AND EXTREMES OF THE MEAN DAILY TEMPERATURE OF THE SEA, near and at IGLOOLIK, H.M.S. "FURY."

Month.				Mean.	Highest.	Lowest.
August	1822	-	-	30.9	32.7	28.3
September	"	-	-	28.0	29.8	27.1

DESCRIPTION OF AURORA AND OTHER LUMINOUS METEORS OBSERVED AT IGLOOLIK.

"Near the time of sunset, October 6th, a splendid parhelion appeared on each side at a distance of 22° 17' from the sun, displaying very rich prismatic colours and quite dazzling the eye to look steadfastly at them. A paraselena was also seen at night, on each side the moon, their angular distance from that object measuring 23°."

"The appearances of the aurora were neither frequent nor brilliant during November. On the 7th, near midnight, this phenomenon appeared from E.S.E. to S.W., forming an

irregular arch of white light, not continuous in every part, and about 8° high in the centre. From the upper margin of this arch, coruscations now and then shot upwards towards the zenith. On the morning of the 21st, Mr. Ross remarked a bright arch of the aurora passing through the zenith from E. to W., and meeting the horizon at each end; besides this, two smaller and apparently concentric arches were visible to the southward, the higher arch being in the centre about 20° above the horizon, and the other about 10°. An arch of the same kind appeared at night in the south-west quarter of the heavens. On the 3rd a column of light tinged with prismatic colours appeared on each side of the sun, at the angular distance of 22° 5', and a parhelion at the same distance above it. The columns indeed were, properly speaking, parts of an imperfect circle or halo, beyond these, however, at the same height above the horizon, and distant from the sun 46°, was a second parhelion on each side, slightly coloured like the others; so that five of these were visible at the same time, though none but the two first mentioned were very distinct. On the 16th Mr. Ross and myself observed near the northern horizon, and exactly opposite to the sun, a circular patch of faint white light; its size was many times larger than that of the sun, though it was not at all defined about the edges, being indeed rather softened off into the purple sky on which it rested. On the 22nd the sun rose with a bright spot of white light at the distance of 20° to 30° on each side of it, and a vertical column of a red colour extended from the sun to about 2° above it. This last phenomenon is very common in cold weather, and when the sun's altitude is very small. A cross was observed about the moon on the 27th, consisting of vertical and horizontal rays of whitish light appearing to pass through that object."

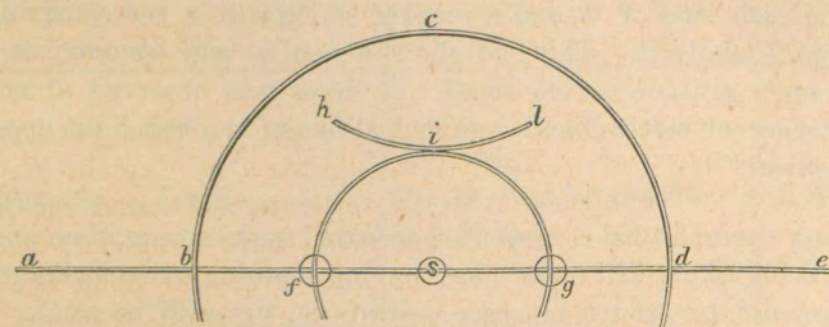
"Parhelia and imperfect halos very often occurred in the spring, their angular distance from the sun being from 22° to 23°, but having nothing remarkable either in form, situation, or colours, to need a separate description on each occasion. It was sometimes observable, however, that though parhelia appear to an observer placed nearly on a level with the sea, to be at a considerable distance from the eye, they are found, on ascending a little eminence, to be produced on some medium comparatively close, perhaps only from one to two miles distant. In this case the land or other distant objects may be seen over them, though there is near them always a mistiness to which they perhaps owe their origin. Although, however, the winter atmosphere of these regions is seldom free from numberless minute particles of snow, which are abundantly deposited upon any thing left in the open air, yet it was not observable, except in some cases of snow-drift, that parhelia were more frequent or distinct when this deposit was the greatest than when the atmosphere was comparatively clear, though in the latter case they are always to appearance most distant. Parhelia occur most frequently, and exhibit the greatest intensity of light, at low altitudes of the sun. This is often particularly observable in the short days, when these phenomena assume a very brilliant appearance soon after sunrise, decrease in splendour towards noon, and resume their brightness as the sun descends towards the horizon; continuing, however,



distinctly visible the whole time, and being sometimes accompanied by a more or less perfect halo undergoing corresponding variations.

"Another peculiarity observed in this winter was the rare occurrence of the aurora, and the extraordinary poorness of its display whenever it did make its appearance. It was almost invariably seen to the southward, between an E.S.E and W.S.W. bearing, generally low, the stationary patches of it having a tendency to form an irregular arch, and not unfrequently with coruscations shooting towards the zenith. When more diffused, it still kept, in general, on the southern side of the zenith, but never exhibited any of those rapid and complicated movements observed in the course of the preceding winter, nor, indeed, any feature that renders it necessary to attempt a particular description. The electrometer was frequently tried by Mr. Fisher, at times when the state of the atmosphere appeared the most favourable, but always without any sensible effect being produced on the gold-leaf."

"On the evening of April 24th, the thermometer being at  $+6^{\circ}$ , some halos and parhelia appeared about the sun, which the annexed figure will best describe. This was the only phenomenon of the kind particularly worthy of notice that occurred during the spring.



s. The sun  $8^{\circ}$  to  $10^{\circ}$  above the horizon.

a, e. A horizontal circle of white light, passing through the sun and parhelia; upon this appeared at times a large white spot, exactly opposite to the sun in the heavens.

f, g. Parhelia situated upon the inner halo f, i, g, of which the radius was  $22^{\circ} 20'$ .

h, i, l. Part of an inverted circle, touching the upper part of the halo f, i, g, and sometimes assuming the form of a bow.

b, c, d. An outer halo, much more brightly tinged with the prismatic colours than the inner one; its radius,  $48^{\circ}$ ."

## No. XVIII.

### Results of Meteorological Observations made at Port Bowen.

H.M. SHIPS "HECLA" AND "FURY," under command of Captain (afterwards Admiral Sir) W. E. Parry, with Captain H. P. Hoppner, second in command, remained from 1824, September 27th, to 1825, July 20th, at Port Bowen, well within the entrance and nearly midway from the shores. The position was in latitude  $73^{\circ} 13' N.$ , longitude  $88^{\circ} 55' W.$ ; and the tide was found to rise from 1 to 6 feet. On September 1st the ships were in latitude  $73^{\circ} 49'$ , longitude  $65^{\circ}$ , and on the 4th, latitude  $74^{\circ} 27'$ , longitude  $66^{\circ}$ . Thus from 1st to 27th although the difference of longitude made was great, the latitude varied only 74 miles, and therefore no very important climatic conditions tend to exclude the meteorological observations of this month from being combined with those taken at the winter station, so as to secure an entire year. Similar considerations apply to August which was passed between latitude  $72^{\circ} 35'$  and  $73^{\circ} 48'$ , longitude  $91^{\circ} 50'$  and  $89^{\circ} 1'$ .

An account of the expedition was published under the title, "Journal of a Third Voyage for the Discovery of a North-West Passage, by Captain William Edward Parry, R.N., F.R.S." The appendix to this narrative contains the meteorological observations from which the results herein given have been deduced, except those contained in Table II., which have been obtained from Sir John Richardson's discussion of Parry's observations on the temperature of the air, as given in the Journal of the Royal Geographical Society for 1839.

It is presumed that the true direction of the winds is given in the narrative. As regards the instruments used, Parry states that the barometers and thermometers were specially constructed by Newman under the superintendence of Mr. Daniell, F.R.S., and that "particular attention was paid to the changes in the barometer during this winter, to which much encouragement was given by the excellence of the instruments with which we were now furnished. The times of register *at sea* had been 3 and 9 a.m. and p.m., those hours having been recommended as the most proper for detecting any horary oscillations of the mercurial column. When we were fixed for the winter, and our attention could be more exclusively devoted to scientific objects, the register was extended to 4 and 10 and subsequently to 5 and 11 o'clock. The most rigid attention to the observation and correction of the column, during several months, discovered an oscillation amounting only to ten thousandth parts of an inch. The times of the maximum and minimum altitude appear, however, decidedly to lean to 4 and 10 o'clock, and to follow a law directly the reverse, as



to time, of that found to obtain in temperate climates, the column being *highest at 4 and lowest at 10 o'clock*, both a.m. and p.m."

"The barometer did not appear to indicate beforehand the changes of the weather with any degree of certainty. Indeed the remark that we had always before made, that alterations in the mercurial column more frequently accompany than precede the visible changes of weather in these regions, was equally true of our present experience; but on one or two occasions hard gales of considerable duration occurred without the barometer falling at all below the mean altitude of the column in these regions, or even rose steadily during the continuance of the gale. During one week of almost constant blowing weather, and two days of very violent gales from the eastward in the month of April, the barometer remained considerably above 30 inches the whole time."

Till the end of October a marine barometer, Jones 514, was used, "which on examination in London had been found the most accurate of the marine barometers supplied." "The ships being now frozen up and free from motion, a mountain barometer, by Newman, No. 80, which Mr. Daniell had examined and recommended as a standard, was employed instead, and three weeks' comparative observations were made by this instrument with 514, in order to ascertain their differences. By these it was found that the marine barometer always stood lower than No. 80; the mean daily difference indicating a mean correction of +.012, which has accordingly been added to the observations registered" from the marine barometer.

The observations from the mountain barometer were corrected for "temperature, neutral point, and capacity," those from the marine barometer were corrected and reduced to agree with the mountain barometer. June 1st, the ships being fitted for sea, the pressure of the atmosphere was subsequently registered by the marine barometer and reduced to agree with the mountain barometer.

"We failed to obtain, even in the severest cold, any absolute hygrometrical expression for the state of the atmosphere, although we had now the advantage of being furnished with the excellent hygrometers on Mr. Daniell's construction . . . . Below an atmospheric temperature of +6°, we failed in obtaining any deposit upon the bulb of the instrument, though on some occasions the ether was frozen in the attempt. On several days during the winter, a haze, or more properly a fog, occurred of such density as to obscure objects at the distance of a quarter of a mile, when there was no perceptible fall or drift of snow to have occasioned this appearance. It always happened, indeed, during serene weather, and generally consisted only of a stratum reaching one or two hundred feet above the sea, over which we could see from the observatory, while it seemed to occupy the whole of the harbour below. That the atmosphere was extremely dry, however, during the winter, appears probable from the circumstance of ropes becoming quite slack by an increase, or rather by a continuance of cold . . . . It would also appear that something like evaporation is going on, from the fact repeatedly noticed, even in the most severe part of the season, that a brass instrument entirely sheltered from the wind may one day be seen covered with numberless minute

snow-crystals, adhering firmly to the metal, and the next perfectly clean and bright, without any possible assistance from wind or artificial heat."

The results of the hygrometrical observations are as follow :—

Month.	9 a.m.			3 p.m.			9 p.m.		
	Tempera- ture.	Dew Point.	Number of observa- tions.	Tempera- ture.	Dew Point.	Number of observa- tions.	Tempera- ture.	Dew Point.	Number of observa- tions.
September 1824 -	26°·4	24°·8	29	26°·8	24°·5	30	26°·3	25°·7	15*
August 1825 -	36·6	33·2	23	37·3	33·4	20	—	—	—

"The daily observations of the hygrometer were discontinued, on account of the difficulty and uncertainty in making them in severely cold weather. An endeavour to ascertain the degree of moisture in the atmosphere was occasionally made throughout the winter, and these are noted as they occurred."

"Two experiments to ascertain if any moisture existed in the atmosphere were made in December, with Mr. Daniell's hygrometer; but none could be detected. On the 21st, the wind being light from the northward, with a perfectly clear sky, the instru-ment was exposed until both thermometers indicated the temperature of the atmosphere, which was -30°, and the freezing mixture (muriate of lime and snow) being then applied to the covered ball, the ether soon became frozen, and the thermometer immersed in it indicated -46°, without the slightest appearance of deposit. Mr. Foster repeated this experiment on the 25th, with very similar results, the temperature of the atmosphere being then -25°·5, with calm and clear weather."

"Mr. Daniell's hygrometer was twice tried during January. On the 3rd, the temperature being -30°, and the instrument subjected to the same process as before, the ether froze without producing any deposit; the wind at this time was light from the eastward, the sky perfectly clear, excepting to the westward, where a dense haze indicated the vapour arising from open water in that direction. On the 24th, the temperature of the atmosphere -35°, the sky clear, with the exception of a few thin clouds near the horizon to the eastward, and the wind light from the north, the experiment was repeated, and when the ether became frozen, the thermometer immersed in it indicated -50°, without the slightest appearance of deposit on the coloured ball."

"Mr. Daniell's hygrometer was again tried on two occasions during February, at the temperature of -39° and -28°·5, and the ether frozen without any deposit being observable."

\* 1st to 15th.



"Twice in April Mr. Foster succeeded in obtaining a deposit on the coloured ball of Mr. Daniell's hygrometer. On the 21st, the temperature of the atmosphere being  $+15^{\circ}$ , the sky partially clear, with large well-defined clouds to the westward, a broad white belt of frozen vapour appeared on the instrument coincident with the surface of the ether, on the temperature being reduced to  $-4^{\circ}$ . On the 25th, the temperature of the atmosphere being  $+6^{\circ}$ , and the sky densely overcast, a similar deposit took place on the coloured ball, on the ether being reduced to the temperature of  $-1^{\circ}5$ "

The following quotations from Parry's published narrative relate to meteorological phenomena:—

*Arctic Winters.*—"It is hard to conceive any one thing more like another than two winters passed in the higher latitudes of the Polar Regions. . . Winter after winter nature here assumes an aspect so much alike, that cursory observation can scarcely detect a single feature of variety. The winter of more temperate climates, and even in some of no slight severity, is occasionally diversified by a thaw, which at once gives variety and comparative cheerfulness to the prospect. But here when once the earth is covered, all is dreary monotonous whiteness—not merely for days or weeks, but for more than half a year together. Whichever way the eye is turned, it meets a picture calculated to impress upon the mind an idea of inanimate stillness, of that motionless torpor with which our feelings have nothing congenial, of anything, in short, but life. In the very silence there is a deadness with which a human spectator appears *out of keeping*. The presence of man seems an intrusion on the dreary solitude of this wintry desert, which even its native animals have for a while forsaken."

*Sensation of Cold.*—"Exposure to a cold atmosphere, *when the body is well clothed*, produces no bad effect whatever beyond a frost-bitten cheek, nose, or finger. As for any injury to healthy lungs from the breathing of cold air, or from sudden changes from this into a warm atmosphere, or *vice versâ*, it may with much confidence be asserted that, with due attention to external clothing, there is nothing in this respect to be apprehended. This inference, at least, would appear legitimate, from the fact that our crews, consisting of 120 persons, have for four winters been constantly undergoing, for months together, a change of from  $80^{\circ}$  to  $100^{\circ}$  of temperature, in the space of time required for opening two doors (perhaps less than half a minute) without incurring any pulmonary complaints at all. Nor is a covering for the mouth at all necessary under these circumstances, though to most persons very conducive to comfort, for some individuals, from extreme dislike to the condensation and freezing of the breath about the 'comforter' generally used for this purpose, have never worn any such defence for the mouth; and this without the slightest injurious effect or uncomfortable feeling beyond that of a cold face, which becomes comparatively trifling by habit."

"In speaking of the external clothing sufficient for health in this climate, it must be confessed that, in severe exposure, quite a *load* of woollen clothes, even of the best quality, is insufficient to retain a comfortable degree of warmth, a strong breeze carrying it off so rapidly that the sensation is that of the cold piercing through the body."

*Winds at Port Bowen.*—"The unusual proportion of easterly winds registered in our journals during this winter must, in my opinion, be attributed to the local situation of our winter quarters, which alone appears to me sufficient to account for the anomaly. The lands on each side of Port Bowen running nearly east and west, and rising to a height of six to nine hundred feet above the sea, with deep and broad ravines, intersecting the country in almost every direction, may be supposed to have had considerable influence on the direction of the wind. In confirmation of this supposition, indeed, it was usually noticed that the easterly winds were with us attended with clear weather, while the contrary obtained with almost every breeze from the west and north-west, thus reversing in this respect also the usual order of things. It was, moreover, observed that the clouds were frequently coming from the N.W., when the wind in Port Bowen was easterly. I must, however, except the *gales* we experienced from the eastward, which were probably strong enough to overcome any local deflection to which a light breeze would be subject, and indeed these were always accompanied with overcast weather and a high thermometer. After the middle of October the gales of wind were very few till towards the middle of April, when we experienced more blowing weather than during the whole winter."

In returning through Lancaster Sound, more than the usual number of icebergs were met with, which Parry "attributed to the extraordinary prevalence and strength of the easterly winds during this summer, which would drive them from the eastern part of Baffin's Bay."

*Snows.*—Snow of the preceding year was not gone when the ships entered Port Bowen; that which fell in the winter began to leave the stones about the end of April, and towards the end of May a great deal was dissolved daily, but pools of water did not form till the first week in June.

The first rain fell on June 7th, "after which the snow disappeared very rapidly from the hills, and all the ravines were pouring large streams of water into the sea."

August 26th, the ships being in Regent Inlet, "a little snow, which had fallen in the course of the last two or three days, now remained upon the land, lightly powdering their higher parts, especially those having a northern aspect, and creating a much more wintry sensation than the large broad patches or drifts, which, on all tolerably high land in these regions, remain undissolved during the whole of each successive summer. With the exception of a few such patches here and there, the whole of this coast was now free from snow before the middle of August."

"There are, perhaps, few things more difficult to obtain than a comparative measure of the quantity of snow that falls at different places, owing to the facility with which the wind blows it off a smooth surface, such as a floe of level ice, and the collection occasioned by drift in consequence of the smallest obstruction. If even a fair measure of the *depth* could be obtained, it would not immediately determine the comparative *quantity*; for a cubic foot of snow so minute as that which falls in high latitudes, and in the compact state in which it lies upon the ground, would probably weigh much



more, and produce a great deal more water than the same measure in a less severe climate, where it usually falls in larger flakes. The weight of a cubic foot of snow at Port Bowen dug out of a drift, and weighed by Mr. Rowland, was 30 pounds, being the mean of several experiments all agreeing very nearly. Thus its mean depth at Port Bowen, measured in 20 different places on the smooth ice of the harbour, was 3 inches on the 5th of April, and on the 1st of May it had only increased to  $4\frac{1}{2}$  inches, while an immense bank 14 feet deep had formed on one side of the 'Hecla,' occasioned by the heavy drifts. The crystals were, as usual, extremely minute during the continuance of the cold weather, and more or less of these were always falling even on the clearest days."

*Thickness of Ice.*—"Lieutenant Ross tried the thickness of the salt-water ice during different periods of the winter, by digging holes in that formed upon the canal by which the ships had entered, and found it to have increased in the following ratio:—

Date.	Whole Thickness, in inches.	Thickness above the Sea, in inches.
November 20th, 1824	30.5	3.8
December 13th "	38.5	4.4
January 1st, 1825	45.3	5.2
February 2nd "	55.9	6.0
March 2nd "	73.0	7.1
April 2nd "	82.0	7.8
May 4th "	86.5	8.0

*Temperature of the Sea.*—From observations made during September 1824, the mean temperature of the sea was:—

At 3 a.m.	28°·1
9 "	28°·2
3 p.m.	28°·2
9 "	28°·1

And the results of those made in August are given as:—

31°·4 mean.  
34°·0 maximum.  
28°·5 minimum.

*Sound.*—"The rate of travelling of sound decreased from 1,098 feet per second, at a pressure of 30.118 inches and temperature +33°·5, to 1,014 feet per second at a pressure of 30.398 and temperature -38°·5, all other circumstances being alike." Conversation was held at a distance of 6,696 feet, the thermometer at the time being -18°, the barometer 30.14 inches, and the weather nearly calm, and quite clear and serene. The details of the observations on sound are given in Parry's Appendix XVI.

*Sunshine.*—The sun was invisible in the middle of winter for 121 days at the ships, but the exact number of days on which it was actually below the horizon was not

ascertained on account of hazy weather about the time of its disappearance; yet as it was seen from the high lands on February 2nd, its absence may be reckoned at 84 days.

*Cloud.*—"There was no want of well-defined clouds this winter; these were almost entirely of the kind called cirro-stratus, or approaching to that modification. Cumuli and cirro-cumuli occurred only with the advance of spring. The sky in this respect differed from that of our winter at Melville Island, and also from those at Winter Island and Igloolik, clouds occurring much more frequently than at the former, and more rarely than at the two latter stations. This difference seems to have coincided nearly with the state of the sea in the offing at each wintering place, clouds occurring with more frequency in proportion to the extent of open water in our neighbourhood. At Port Bowen we had occasionally lanes of clear water in the offing as late as the 22nd of January, and the ice could be heard in motion until the 11th of February, but the water was of small extent after the first month subsequent to our arrival in winter quarters. The occasional occurrence of fog, and the appearance of a dark water sky to the northward, frequently observed from the hills during the winter, render it extremely probable that Barrow's Strait was never entirely closed,—a probability confirmed by the appearance of it at all times of the year in which it is accessible by ships."

*Halos.*—"Halos appeared very frequently round the moon, particularly about the times of her opposition, and when there was any haze in the atmosphere. Two or three times an indistinct paraselena was seen on each side, situated, as usual, upon the halo, and at the angular distance of about 23° from the moon. In one instance only, the paraselena were slightly coloured with a faint red tint. In the autumn and spring, particularly the latter, halos and parhelia were very frequently about the sun, the measurement of their angular distance from that luminary being always between 22° and 23°. None of these phenomena were such as to deserve further notice, except one on the 29th of March, when at 9.30 a.m., an imperfect halo appeared round the sun, with a faint parhelion on each side. On the part of the halo directly over the sun, was seen a segment of an inverted circle, faintly coloured, and again above this, at the distance of 46° 40' from the sun, was a short segment of another inverted circle, coloured like a brilliant rainbow. A circle of broad but faint white light could be traced completely round the heavens, passing through the sun and parhelia, and parallel to the horizon; and situated on this circle, at the distance of  $114\frac{1}{4}^\circ$  on each side of the sun, was a large white spot. The phenomenon exhibited a part of that described at Melville Island on the 9th of April\* 1820, the circles now seen, besides the halo, corresponding with those marked *ad v*, *m f n*, and *t u*, in the diagram accompanying that description. Minute particles of snow were at this time falling in great abundance."

*Aurora.*—"The aurora, which constitutes one of the peculiar features of a polar winter, occurred with nearly the same frequency as on former occasions. The number

\* See page 268.



of nights on which it is registered are :—2 in October, 5 in November, 7 in December, 15 in January, 13 in February, 5 in March, being in the whole 47 from October to March. It may have appeared faintly on a few other occasions, not noticed in our journals, and unquestionably would have been seen more frequently but for the height of the land on the south side of Port Bowen, which intercepted our view to the altitude of  $5^{\circ}$  to  $6^{\circ}$ . By far the greater part of these phenomena assumed one general character and occupied nearly the same position. It usually consisted of an arch, sometimes tolerably continuous, but more frequently broken into detached irregular masses or nebulae of light, extending from about W. to S.E. (true). It sometimes, however, extended a few points beyond these bearings, but very rarely occupied any of the northern part of the heavens. Its termination to the S.E. was never exactly visible, owing to the height of the land in that quarter; but, upon the whole, the arch seems to have been more frequently bisected by the plane of the magnetic, than by that of the true meridian. The altitude of the upper margin of a permanent arch seldom exceeded  $10^{\circ}$  or  $15^{\circ}$ , and from this coruscations were generally observed to be shooting towards the zenith. In a few instances the arch itself passed as high as the zenith, and on a single occasion, on the 28th of January, its direction was from true north to south. The lower edge of the arch was generally well defined and unbroken, and the sky beneath it appeared, by contrast, so exactly like a dark cloud (to me often of a brownish colour), that nothing at the time of viewing it could well convince one to the contrary, if the stars shining there with undiminished lustre did not discover the deception. This winter certainly afforded but few brilliant displays of the aurora.\* The following notes describe the most remarkable. "November 27th, 2 a.m., aurora forming an irregular arch from S.S.E. to N.W. by N., sometimes very brilliant with pencilled rays shooting towards the zenith."

"Late on the night of December 21st, the phenomenon appeared partially and with a variable light in different parts of the southern sky for several hours. At 7 a.m. it became more brilliant and stationary, describing a well-defined arch, extending from the E.S.E. horizon to that at W.N.W., and passing through the zenith. A very faint arch was also visible on each side of this, appearing to diverge from the same points in the horizon,\* and separating to  $20^{\circ}$  distance in the zenith. It remained thus for 20 minutes, when the coruscations from each arch met, and after a short but brilliant display of light gradually died away."

"Early on the morning of January 15th, the aurora broke out to the southward, and continued variably for three hours between a N.W. and S.E. bearing. From 3 to 4 a.m. the whole horizon from south to west was brilliantly illuminated, the light being continuous almost throughout the whole extent, and reaching several degrees in height. Very bright vertical rays were constantly shooting upwards from the general mass. At 5h. 30m., it again became so brilliant as to attract particular notice, describing two arches in an east and west direction very near the zenith, with bright coruscations

\* "I am aware that this appearance is usually referred to the effect of viewing the phenomenon in perspective; but I here describe *appearances* only."

issuing from it; but the whole gradually disappeared with the returning dawn. At dusk the same evening the aurora again appeared in the southern quarter, and continued visible nearly the whole night, but without any remarkable feature."

"About midnight on January 27th, this phenomenon broke out in a single compact mass of brilliant yellow light, situated about a S.E. bearing, and appearing only a short distance above the land. This mass of light, notwithstanding its general continuity, sometimes appeared to be evidently composed of numerous pencils of rays compressed, as it were, laterally into one, its limits both to the right and left being well defined and nearly vertical. The light, though very bright at all times, varied almost constantly in intensity, and this had the appearance (not an uncommon one in the aurora) of being produced by one volume of light overlaying another, just as we see the darkness and density of smoke increased by cloud rolling over cloud. While Lieutenants Sherer and Ross and myself were admiring the extreme beauty of this phenomenon from the observatory, we all simultaneously uttered an exclamation of surprise at seeing a bright ray of the aurora shoot suddenly downward from the general mass of light, *and between us and the land*, which was there distant only three thousand yards. Had I witnessed this phenomenon by myself, I should have been disposed to receive with caution the evidence even of my own senses, as to this last fact; but the appearance conveying precisely the same idea to three individuals at once, all intently engaged in looking towards the spot, I have no doubt that the ray of light actually passed within that distance of us."

"About 1 a.m., February 23rd, the aurora again appeared over the hills in a south direction, presenting a brilliant mass of light very similar to that just described. The rolling motion of the light laterally was here also very striking, as well as the increase of its intensity thus occasioned. The light occupied horizontally about a point of the compass, and extended in height scarcely a degree above the land, which seemed, however, to conceal from us a part of the phenomenon. It was always evident enough that the most attenuated light of the aurora sensibly dimmed the stars, like a thin veil drawn over them."

Table I. gives the results of the observations made on the pressure of the atmosphere. The general monthly means have all been deduced from the means at 3 and 9 a.m. and p.m. for the sake of uniformity. They show that the pressure was greatest in March and least in August. The means for the year do not show any diurnal range, and though most of the monthly values show diurnal range, they give discordant hours for the critical epochs.

The barometer observations have been altered as follows, for evident errors of reading off:—

	inches.		inches.
December 8th, 9 p.m. corrected to 29	574.	February 23rd, 9 a.m. corrected to 29	851.
" " 10 " " "	579.	May 10th, 9 p.m. " "	925.
" 29th, 9 " " "	769.	July 9th, 3 a.m. " "	854.
January 4th, 4 a.m. " "	860.	" 21st, 3 p.m. " "	849.
" 14th, 9 p.m. " "	580.	" 23rd, 3 " " "	644.
February 6th, 9 a.m. " "	428.	" 24th, 3 a.m. " "	815.



Table II. is compiled from Sir John Richardson's discussion of arctic temperatures. It gives the means at the odd hours, and the daily mean temperature of the air for each month. The warmest month was July,  $38^{\circ}9$ ; the coldest January,  $-28^{\circ}9$ ; though March was very nearly the same. These give a mean range during the year of  $67^{\circ}8$ . The mean temperature of the year was  $4^{\circ}2$ .

Table III. comprises the extremes of atmospheric pressure in each month, with the temperature, wind, and weather of the same day. The highest pressure was  $30\cdot683$  in May, the lowest  $29\cdot030$  in September, so that the absolute range was  $1\cdot653$  inches. The range was greatest in September, least in August. The temperatures were lower with the high than with the low pressures, except in the summer, when they inclined the reverse way. The winds were more frequently from the eastward, and the weather was finer with the high than with the low pressures.

Table IV. exhibits the extremes of the air temperature, with the pressure, wind, and weather of the same day. The absolute maximum was  $51^{\circ}$  in August, minimum  $-47^{\circ}5$  in March; range  $98^{\circ}5$  during the year. The greatest range in any one month was  $57^{\circ}$  in April; the least,  $18^{\circ}$ , in September. The low temperatures were attended with higher pressure generally, and clearer weather than the high ones.

Table V. summarises the daily winds of each month under sixteen points of the compass, showing their mean force expressed in the Beaufort scale. The winds of September and August were of course not subject to the local modifying circumstances of Port Bowen, but to those of varying geographical positions. The most frequent wind was from S.E. to E. in all months except May, when it was N.W., July W., and August N.E.

Table VI. summarises the daily weather of each month, expressed in the Beaufort notation. The atmosphere was clearest in January and February, and most overcast in April and May. There was also the greatest frequency of mist in April and of fog in July. Fog was confined to the summer. During the five months November to March snowfall is mentioned only on five days. During the year precipitation occurred on 69 days.

*Animals.*—A flock or two of ducks were seen October 3rd, but none afterwards till a pair was seen in the beginning of June. A few snow buntings, a very few sandpipers, now and then one or two glaucous, ivory, and kittiwake gulls were seen during the spring. A pair of ravens appeared occasionally during the whole winter. The game list for the year comprised 12 bears, 6 foxes, 3 hares, 1 ermine, a few mice, 200 ptarmigan killed in April, and many hundred dovebies in June. A whale, bone 5 feet, was killed in July.

TABLE I.  
MEAN ATMOSPHERIC PRESSURE, at PORT BOWEN, Year 1824-5.

Hours.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Year.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
3 a.m.	29·690	29·964	29·894	29·873	29·761	29·892	30·104	30·064	30·052	29·889	29·816	29·683	29·890
4 "	—	—	·899	·877	·763	·894	·110	·070	—	—	—	—	—
5 "	—	—	—	—	—	·889	·109	·067	—	—	—	—	—
9 "	·688	·954	·899	·873	·758	·884	·110	·065	·054	·894	·814	·685	29·890
10 "	—	—	·897	·869	·754	·879	·104	·059	—	—	—	—	—
11 "	—	—	—	—	—	·881	·103	·061	—	—	—	—	—
3 p.m.	·688	·960	·907	·869	·761	·886	·109	·070	·053	·889	·817	·685	29·891
4 "	—	—	·904	·869	·760	·889	·110	·068	—	—	—	—	—
5 "	—	—	—	—	—	·890	·108	·071	—	—	—	—	—
9 "	·690	·972	·897	·863	·766	·886	·108	·074	·047	·884	·814	·679	29·890
10 "	—	—	·891	·858	·762	·883	·105	·066	—	—	—	—	—
11 "	—	—	—	—	—	·881	·102	·065	—	—	—	—	—
Means	29·689	29·962	29·899	29·869	29·762	29·887	30·108	30·068	30·051	29·889	29·817	29·683	29·890

TABLE II.  
MEAN TEMPERATURE OF THE AIR, at PORT BOWEN, Year 1824-5.

Hours.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Year.
1 a.m.	+25·3	+10·4	-4·5	-18·9	-29·0	-27·5	-31·4	-12·5	+12·4	+31·9	+36·5	+34·3	+2·3
3 "	25·5	10·4	5·0	18·8	29·2	27·3	31·1	12·7	12·8	33·0	36·9	34·4	2·4
5 "	25·3	10·1	5·1	18·6	29·3	27·4	31·4	11·5	15·3	34·3	37·7	34·4	2·8
7 "	25·6	10·7	5·5	18·6	29·3	27·1	30·3	7·5	17·6	36·8	38·6	35·4	3·9
9 "	26·2	11·1	5·4	18·5	28·6	26·7	26·2	3·5	20·3	38·1	39·8	35·9	5·2
11 "	26·3	11·9	5·5	18·5	28·3	26·6	23·9	-0·8	21·0	39·6	41·0	37·0	6·1
1 p.m.	26·8	11·9	5·4	19·1	28·7	27·1	22·7	+0·8	22·1	39·6	41·2	37·0	6·4
3 "	26·7	11·5	5·4	19·6	28·8	27·6	23·7	+0·1	21·9	39·5	40·8	37·4	6·1
5 "	26·3	11·1	5·1	19·4	28·8	27·3	26·4	-2·9	19·5	36·7	39·8	37·2	5·1
7 "	26·0	10·9	4·3	19·7	28·9	27·6	29·7	6·6	17·8	36·2	38·8	36·3	4·1
9 "	25·5	10·1	4·3	19·3	28·9	27·8	31·5	9·9	16·1	34·7	38·2	35·5	3·2
11 "	+25·3	+9·7	-4·5	-19·5	-29·1	-27·7	-31·9	-11·1	+14·4	+32·9	+37·3	+34·4	+2·5
Means	+25·9	+10·8	-5·0	-19·0	-28·9	-27·3	-28·4	-6·5	+17·6	+36·1	+38·9	+35·8	+4·2



TABLE III.

EXTREMES OF ATMOSPHERIC PRESSURE, WITH TEMPERATURE OF THE AIR, THE WIND AND WEATHER OF THE SAME DAY, at PORT BOWEN, Year 1824-5.

Month.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Weather.	Range.
	d. h.	ins.				d. h.	ins.				in.
September 1824	25 21	30.437	+20.5	S.E. 4	b, s	7 21	29.030	+31.1	E. 2	m s	1.407
October "	27 3	.391	+1.0	N.N.E. 2	m	2 3	.383	+15.5	E.S.E. 2	"	1.008
November "	7 10	.496	-13.0	E. 2	b c	18 10	.488	-13.	N.W. 4	b	1.008
December "	15 3	.421	30.5	" 1	b	3 16	.481	18.2	N. 2	m	.940
January 1825	10 21	.282	36.9	N.E. 2	"	20 22	.321	24.2	E. 1	b	.961
February "	3 4	.468	33.1	E.S.E. 5	m	5 22	.438	15.8	N.W. 5	q m	1.030
March "	10 21	.508	-32.2	E. 2	b	20 11	.624	22.3	" 2	m	.884
April "	21 17	.376	+8.1	E.S.E. 2	m	3 11	.702	-23.1	E. 2	"	.674
May "	5 3	.683	3.5	N.W. 2	b	18 9	.536	+21.2	N. 4	c q	1.147
June "	5 9	.194	35.3	E. 2	"	29 15	.343	36.4	S. 2	o	.851
July "	28 9	.084	39.5	S.W. 2	b c	1 21	.358	37.	S.E. 4	q r s	.726
August "	26 9	29.928	+33.4	N.E. 2	"	31 9	.335	+30.8	N.W. 4	c s	.593
Year -	May.	30.683	—	—	—	Sept.	29.030	—	—	—	1.653

TABLE IV.

EXTREMES OF TEMPERATURE, WITH THE MEAN PRESSURE OF THE ATMOSPHERE, THE WIND AND WEATHER OF THE SAME DAY, at PORT BOWEN, Year 1824-25.

Month.	Date.	Max.	Bar.	Wind.	Weather.	Date.	Min.	Bar.	Wind.	Weather.	Range.
September 1824	27	+34.	ins. 29.81	S.E. 4	c s r	26	+16.	ins. 30.32	S.E. 4	b c, s	18.
October "	6	31.5	.47	E.N.E. 4	m, s	28	-12.	.28	E. 4	b c	43.5
November "	27	+17.	.83	S.E. 6	m	26	26.	.06	E.S.E. 2	b	43.
December "	7	-4.5	.66	N.E. 1	b	15	35.	.39	Var. 1	"	30.5
January 1825	19	14.5	.71	E. 4	o	26	42.5	29.82	E. 2	"	28.
February "	27	8.	.87	" 2	m, s	21	45.	.72	" 2	"	37.
March "	26	-9.	30.34	N. 1	m, b	2	47.5	30.36	" 2	"	38.5
April "	21	+20.	.27	E.S.E. 4	c	1	37.	.01	E.S.E. 4	"	57.
May "	28	39.	.44	S. 2	o, s	5	-7.5	.66	N.W. 2	"	46.5
June "	8	47.	29.77	E. 4	c, p	15	+23.	.00	E. 4	"	24.
July "	23	50.	.67	S.E. 5	c	21	30.	29.88	N. 1	b m	20.
August "	15	+51.	.77	W.N.W. 5	"	30	+25.	.70	N.E. 4	c q	26.
Year -	Aug.	+51.	—	—	—	March	-47.5	—	—	—	98.5

TABLE V.

SUMMARY OF THE WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), at PORT BOWEN, Year 1824-5.

Months.	Total Observations.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
September 1824.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October -	-	30	2	3.0	—	—	—	1	2.0	1	6.0	2	3.5	1	5.0	9	4.0
November -	-	30	1	2.0	2	3.0	2	4.5	1	3.0	4	3.0	6	3.2	6	2.2	—
December -	-	30	1	4.0	—	—	—	—	—	4	2.5	4	3.2	8	3.9	—	—
January 1825.	-	31	5	2.4	—	—	—	1	1.0	—	—	5	2.4	9	3.3	5	3.8
February -	-	31	3	4.3	—	—	—	2	2.0	—	—	10	2.4	9	4.2	1	5.0
March -	-	28	2	3.0	2	3.0	2	2.0	—	—	—	12	3.0	6	4.2	—	—
April -	-	31	1	3.0	—	—	—	—	—	18	2.3	—	—	—	—	—	—
May -	-	30	2	3.0	—	—	—	—	—	7	2.7	11	4.0	2	2.0	—	—
June -	-	31	3	3.3	—	—	—	2	5.0	—	—	7	2.4	3	4.0	1	6.0
July -	-	30	1	4.0	—	—	—	1	4.0	—	—	7	2.9	6	3.5	2	4.0
August -	-	31	4	1.5	—	—	—	1	4.0	—	—	—	—	—	—	5	3.4
		31	4	2.5	5	3.4	8	4.0	1	4.0	—	—	—	—	—	—	—

(continued.)

Months.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		Calms.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
September 1824.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October -	-	1	4.0	1	4.0	—	—	—	—	—	1	2.0	3	4.0	2	3.0	—	—	—
November -	-	—	—	—	2	4.0	—	—	2	2.5	—	—	5	4.2	1	4.0	3	2.7	—
December -	-	—	—	—	2	2.0	—	—	—	—	—	—	2	4.0	—	—	2	1.0	—
January 1825.	-	—	—	—	—	—	—	—	—	—	—	—	3	3.3	—	—	3	2.0	—
February -	-	—	—	—	—	—	—	—	—	—	1	2.0	2	4.0	—	—	—	—	1
March -	-	—	—	—	2	3.5	—	—	1	2.0	1	5.0	7	3.7	—	—	1	2.0	—
April -	-	—	—	—	—	—	—	—	4	2.5	—	—	2	3.5	1	3.0	1	2.0	—
May -	-	2	2.0	1	4.0	1	5.0	—	—	2	2.0	—	8	3.0	—	—	1	2.0	—
June -	-	2	2.0	—	—	4	3.0	—	—	3	2.0	—	4	2.5	—	—	—	—	—
July -	-	1	2.0	1	2.0	3	2.0	—	—	12	2.0	—	4	2.5	—	—	—	—	—
August -	-	—	—	1	4.0	4	4.0	—	—	—	—	1	6.0	7	4.3	—	—	—	—



TABLE VI.  
SUMMARY OF WEATHER NOTATIONS, at PORT BOWEN, Year 1824-25.

Month.	b.	c.	o.	m.	f.	r.	s.	q.			
September 1824	-	-	1	17	12	2	2	3	15	1	
October	"	-	-	5	11	15	14	—	—	6	3
November	"	-	-	12	4	14	11	—	—	2	6
December	"	-	-	15	2	14	6	—	—	—	2
January 1825	-	-	18	2	11	6	2	—	1	3	
February	"	-	-	13	4	11	7	—	—	1	—
March	"	-	-	14	6	11	13	—	—	1	1
April	"	-	-	10	3	17	17	—	—	6	5
May	"	-	-	4	11	16	11	1	—	10	5
June	"	-	-	8	13	9	2	3	4	4	—
July	"	-	-	7	12	12	—	13	8	2	2
August	"	-	-	7	23	1	1	1	2	4	2

No. XIX.  
Results of Meteorological Observations made at Port Leopold.

H.M. SHIPS "ENTERPRISE" AND "INVESTIGATOR," under command of Sir James Clark Ross, passed the winter of 1848-9 at Port Leopold in latitude 73° 50' N., longitude 90° 12' W. On board the "Investigator," Captain E. J. Bird, observations of the barometer and thermometer were made hourly and were registered in the log by J. H. Allard, second master. This log has been obtained on loan from the Public Record Office. As no information could be obtained regarding the instruments used, it was not thought worth while to discuss the whole of the observations, and those for the even hours only have been taken.

The true direction of the wind was observed, and the force of the wind was estimated by Beaufort's scale. The state of the weather was registered by Beaufort's notation.

It has been assumed that [the barometer was mounted in a wooden frame, and corrections for the temperature of its attached thermometer have been applied accordingly, but no other corrections whatever have been attempted.

Nothing is known of the thermometers used, except that on December 12th, the log states: "Mercury frozen in thermometer, Pastorelli, No. 416." This could not have been the thermometer used in the register, but the statement indicates that the one used was about 9° in error at the freezing point of mercury, and presuming that it was correct at the freezing point of water, the following corrections have been applied to the observations:—

At 32°, 0·0; at 22°, +1·1; at 12°, +2·2; at 2°, +3·3; at -8°, +4·4; at -18°, +5·5; at -28°, +6·6; at -38°, +7·7; at -46°, +8·8; at -58°, +9·9. It may not be perfectly safe to apply these corrections, for the thermometer may have been changed during the period; but, as there was no evidence of such change, and the error was evidently large, the introduction of some correction became imperative.

Table I. contains the results of the barometrical observations. The mean pressure of the year was 29·816 inches, and the mean diurnal range of pressure deduced from the year's observations is only ·018 inch, having maxima about 5 a.m. and 4 p.m., and minima about 11 a.m. and 10 p.m. The diurnal range deduced for each separate month is the least in the warm months, June, July, and August, when the thermometer attached to the barometer had the smallest daily range. It may be that the abrupt changes of temperature shown by the attached thermometer have had something to do with this. In the winter, when artificial heat was maintained, the attached thermometer was lowest between 6 and 8 a.m., and went up 10° or 12° before noon.



Table II. shows the mean temperature of the air for the year to have been about 2°. July was the warmest month, 36°·2, December the coldest, -32°·4; so that the mean range of temperature was 68°·6. The diurnal range of temperature was greatest in May, 8°·4, and insignificant in December.

Table III. exhibits the extremes of atmospheric pressure, with the accompanying temperature, wind, and weather. The barometer was highest, 30·546 inches, in February; lowest, 28·935 inches, in the same month. The weather seems to have been clearer and quieter with the high, than with the low barometers.

Table IV. exhibits the extremes of the temperature of the air, with accompanying pressure, wind, and weather. The maximum temperature, 45°, occurred in June, the minimum, -52°, in February. Thus the absolute range of temperature during the year was 97°. The highest temperatures seem to have happened with a lower barometer, more wind, and worse weather than the lowest. The monthly range of temperature was greatest in November, 50°, and least in July, 10°.

Table V. comprises the monthly sums of the wind components.

Table VI. gives the sums of the wind components for the entire year, with their resultants. These show a variation of the wind in azimuth from N. 13° E. at 8 a.m. to N. 1° W. at 10 p.m., with a small intermediate oscillation. The resultant forces of the winds point to a maximum about midday, and a minimum about midnight, but not conclusively. The resultant wind for the year is N. 5° E., force 0·9 of Beaufort's scale.

Table VII. contains the resultants of the winds of each month computed from the mean components in Table V. For no month was the resultant from the southward.

Table VIII. shows the distribution of calms throughout the day in each month, with the total for the year. The observations being two-hourly, represent 454 hours, or about 19 days. On the whole calms occur most frequently about 2 a.m., and least about noon. Calms were most frequent in December, least in July.

Wind force 8 and upwards was registered 10 times in September, 19 in October, 8 in November, 7 in December, 11 in January, 69 in February, 29 in March, 23 in April, 12 in May, 13 in June, 4 in July, and 5 in August.

February appears to have been exceptionally stormy.

Table IX. is a summary of the winds under sixteen points of the compass, with their mean force. In October, November, July, and August the prevalent winds were from N.W., N.N.W., or N.; in September they were from N.E. and E.N.E. In all the other months, while the greatest amount of motion was from the northward, the most frequent winds were from S.S.E. Indeed the frequency of winds from S.S.E. and N.N.W. in these months suggests some local cause affecting the winds generally.

Table X. gives the sums of the weather notations in each month. Rain fell on 12 days, during June, July, and August; snow on 58 days during the year; making altogether only 70 days on which aqueous precipitation occurred. During the four months November to February snow fell only on 4 days; there was none at

all in December. The clearest weather occurred in winter. In summer mist and fog were most frequent. Squalls were most frequent in winter.

Temperature of the Sea was observed from September 1st to 13th inclusive, with the following results:—

HOURS.		2.	4.	6.	8.	10.	N.	2.	4.	6.	8.	10.	M.
Sea	-	29 <sup>0</sup> ·4	29 <sup>0</sup> ·2	29 <sup>0</sup> ·2	29 <sup>0</sup> ·5	29 <sup>0</sup> ·8	29 <sup>0</sup> ·6	29 <sup>0</sup> ·8	29 <sup>0</sup> ·8	29 <sup>0</sup> ·6	29 <sup>0</sup> ·7	29 <sup>0</sup> ·4	29 <sup>0</sup> ·2

A cask containing a memorandum was thrown overboard from the "Investigator," 1848, August 28th, in latitude 73° 50' N., longitude 78° 6' 30" W., and was picked up by the whaler "Prince of Wales," Captain T. Lee, 1848, October 1st, in latitude 68° 10' N., longitude 64° 30' W. (See Parliamentary Paper, No. 188, year 1849.) Supposing the track of the cask to have been direct, its course was S. 37° 49' E., and the distance made good by it 430·4 miles, giving a drift of 12·7 miles per day.

REMARKS from the LOG of H.M.S. "INVESTIGATOR."

1848, SEPTEMBER.

- 1st, Noon - Lat. 73° 57' N., long. 87° 1' W. Icebergs in sight.
- 2nd, Noon - Lat. 73° 58', long. 89° 14'. Some seals, several loose pieces of ice.
- 3rd, Noon - Lat. 74° 15', long. 88° 36'. A whale seen. Loose ice.
- 4th, Noon - Lat. 74° 10', long. 89° 6'. Several straggling pieces of ice.
- 5th, Noon - Lat. 74° 20', long. 88° 40'. A great deal of loose ice.
- 8th, Noon - Lat. 74° 7', long. 90° 21'. Much heavy ice.
- 9th, Noon - Lat. 73° 46', long. 89° 48'. A great deal of loose ice.
- 11th, Noon - Lat. 73° 50', long. 90° 12'. A good deal of loose ice.
- 13th, Noon - Port Leopold. Pack ice outside bay to Ed.

The ice kept forming and drifting out of the bay, until the 26th, when it became fixed.

OCTOBER.

- 17th, 10 p.m. - A faint beam of aurora in N.W.
- 24th, 10.30 a.m. A mock sun.
- 31st, 10 a.m. - A parhelion round the sun.

NOVEMBER.

- 6th, Noon - Two mock suns.
- 7th, 6 p.m. - A halo round the moon, diameter 45°, three mock moons were in the circle.
- 8th, 6 p.m. - A halo round the moon.
- 9th - One large iceberg off the harbour mouth. Also a great deal of floe ice.
- 9th, 10 p.m. - A halo round the moon.
- 12th - Two small icebergs off the entrance of the harbour and one large one in the same position as when last seen.
- 18th, 7 p.m. - Aurora.
- 19th, 2 a.m., 4.30 a.m., and Mid. Aurora.



- 21st, 1 a.m., 5 a.m., and 11.45 p.m. Aurora.  
 22nd, 9 p.m. - Aurora.  
 23rd, 6 a.m. - Aurora.  
 24th, 1 a.m. - Aurora.  
 26th, 1 a.m. and 8 a.m. Aurora.  
 30th, 8 p.m. - Aurora in W.  
 During the month 11 foxes were caught.

## DECEMBER.

- 3rd, 8.15 p.m. - A halo round the moon.  
 5th, 5 p.m. - A halo round the moon.  
 6th, 10 p.m. - Aurora described a faint arch through the zenith, touching the northern and southern horizons.  
 7th, 9 p.m. - Halo round the moon.  
 9th, 6 a.m. - Moon refracted a brilliant scarlet.  
 9th, 1 p.m. - Two faint arches of the aurora extending across the zenith from E.N.E. to W.S.W.  
 9th, 7 p.m. - Halo round the moon and two mock moons.  
 10th, 9 p.m. - Halo round the moon.  
 11th, 2 a.m. - Well-defined halo round the moon, diameter,  $46^{\circ}$ .  
 11th, 5 a.m. - Bright halo round the moon.  
 12th, 2 a.m. - Halo round the moon.  
 12th, 7 p.m. - Halo round the moon.  
 12th, 11.15 p.m. Mercury frozen in the thermometer, standing at  $47\frac{1}{2}^{\circ}$ , No. 416, Pastorelli.  
 13th, 3 p.m. - A few faint flashes of aurora in W. and S.  
 16th, 6 p.m. - Aurora describing an arch through the zenith from N.W. to S.E. horizons.  
 18th, 6.45 p.m. - A few faint flashes of aurora to N.W. and S.E.  
 19th, 8 p.m. - Faint flashes of aurora.  
 20th, 2.15 a.m. - Aurora forming an arch from N. by E. to S.S.E.  
 21st, 2 a.m. - A bright gleam of aurora in W.  
 21st, 8 a.m. - Flashes of aurora in W.  
 22nd, 9.30 p.m. - A bright arch of aurora extending across the zenith from N.W. to S.E.  
 24th, 5 p.m. - Faint beams of aurora to S.  
 25th, 6 p.m. - A streak of aurora across the zenith from N.W. to S.E.  
 26th, 1 to 2 a.m. Many undefined lines of aurora.  
 29th, 7.25 a.m. - Aurora forming an irregular arch.  
 During December three foxes were caught.

## 1849, JANUARY.

- 3rd, 10 p.m. - Aurora forming an arch in the Sd. from S.E. to W.S.W.  
 4th, 2 p.m. - Halo round the moon and two mock moons.  
 5th, 7.45 a.m. - An irregular arch of aurora to the S.W., of a light straw colour.  
 6th, 11.30 p.m. - Bright halo round the moon.  
 7th, 9 p.m. - Halo round the moon.  
 9th, 5 a.m. - A well-defined halo round the moon. Altitude,  $22^{\circ} 13'$ ; semi-diameter,  $17^{\circ} 30'$ .  
 12th, 5 a.m. - Halo round the moon.  
 13th, 9 a.m. - Halo round the moon, diameter,  $47^{\circ}$ .  
 15th, 2 a.m. - Halo round the moon, estimated diameter,  $50^{\circ}$ .  
 16th, 11 p.m. - Faint flashes of aurora to N.W.  
 18th, 7 p.m. - Aurora forming an arch from N.W. to S.S.E.  
 19th, 5 p.m. - Faint shooting streaks of aurora in the N.W. and S.E.  
 During January two foxes were caught.

## FEBRUARY.

- 2nd, 4 p.m. - Halo round moon.  
 3rd, 1 a.m. - A faint halo round the moon.  
 4th, 7 p.m. - Halo round the moon, diameter,  $39^{\circ}$ .  
 5th, 7 p.m. - Faint halo round the moon.  
 8th, 9 p.m. - Halo round the moon and two mock moons.  
 10th, 3.30 a.m. - Halo round the moon and two mock moons.  
 20th, 10 a.m. - A parhelion on each side of the sun.  
 23rd, 11 a.m. - A parhelion round the sun.  
 24th, 2 a.m. - Faint beams of aurora in the S.W. quarter.  
 During February two foxes were caught.

## MARCH.

- 1st, 9 a.m. - A parhelion on W. side of sun.  
 8th, 10 a.m. - A halo round the sun and two mock suns.  
 11th - - A halo with three mock moons in its circle, diameter of halo  $43^{\circ}$ , moon's altitude  $10^{\circ} 30'$ .  
 14th, 9 p.m. - Faint beams of aurora in S.E.  
 15th, 2 a.m. - Aurora forming an arch of great brightness from N.E. to S. by W.  
 21st, 4 p.m. - A halo round the sun.  
 22nd, 6 a.m. - A halo round the sun.  
 During March six foxes were caught; two hares and some grouse were seen on 2nd, and a bear on 25th.

## APRIL.

- 2nd, 5 p.m. - A parhelion round the sun.  
 16th, 2 p.m. - Halo round the sun and three mock suns.  
 During April only one fox was caught; a snow-bunting was shot on 21st.

## MAY.

- 2nd, 5 a.m. - A halo round sun and a parhelion on each side.  
 2nd, 8.15 a.m. - A double halo round sun.  
 Three snow-buntings and five other birds were seen during the month.

## JUNE.

Snow-buntings were seen on the 1st and 3rd, a gull on 4th, a dovekie on 10th, ducks on 11th, a seal on 12th; between this and 18th flights of ducks were frequently seen flying N. ; 18th to 30th, shot 791 dovekies, 3 geese, 12 ducks, 4 gulls, 57 loons.  
 On 23rd the temperature of water at bottom was  $35^{\circ}$ , on the canal  $36^{\circ}$ ,  $36^{\circ} 5'$ , and  $37^{\circ}$ .

## JULY.

During July 597 dovekies were shot, 1,381 loons, 1 duck, 3 seals. The dovekies became scarce about 20th.

## AUGUST.

From 1st to 3rd, 60 loons were shot and 12 dovekies.  
 On 10th the ice was observed drifting up Regent Inlet to the S.W. On 16th, 17th, 22nd several white whales were seen, and on 31st two black and many white whales.  
 29th, 6 p.m. - Working out of Port Leopold.  
 30th, Noon - Lat.  $73^{\circ} 57'$ , long.  $89^{\circ} 0'$ . Amongst ice.  
 31st, Noon - Lat.  $74^{\circ} 10'$ , long.  $88^{\circ} 26'$ .



TABLE I.  
MEANS OF BAROMETRICAL OBSERVATIONS, made at PORT LEOPOLD, 1848, September, to 1849, August.

Hours.	1848.				1849.								Year.
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	
2 a.m. -	inches. 29·741	inches. 29·849	inches. 29·851	inches. 29·686	inches. 29·839	inches. 29·823	inches. 29·906	inches. 29·965	inches. 29·995	inches. 29·840	inches. 29·673	inches. 29·677	29·820
4 " -	·749	·854	·851	·696	·842	·823	·915	·965	·996	·843	·674	·681	·824
6 " -	·742	·853	·851	·700	·838	·826	·922	·969	·997	·844	·674	·681	·825
8 " -	·740	·840	·851	·694	·824	·818	·902	·950	·986	·842	·672	·680	·817
10 " -	·727	·818	·830	·683	·805	·806	·902	·946	·981	·835	·671	·676	·807
Noon -	·728	·820	·840	·683	·798	·809	·900	·949	·983	·835	·669	·673	·807
2 p.m. -	·729	·835	·847	·697	·803	·816	·905	·951	·989	·836	·671	·681	·813
4 " -	·734	·837	·850	·702	·808	·827	·911	·958	·991	·839	·672	·683	·818
6 " -	·739	·842	·847	·696	·810	·829	·906	·957	·987	·837	·674	·685	·817
8 " -	·741	·840	·845	·697	·815	·833	·903	·958	·985	·835	·669	·683	·817
10 " -	·739	·840	·837	·689	·810	·829	·899	·961	·983	·834	·668	·679	·814
Midnight -	·743	·847	·839	·690	·808	·831	·903	·963	·985	·838	·666	·678	·816
Means -	29·738	29·840	29·845	29·693	29·817	29·823	29·906	29·958	29·988	29·838	29·671	29·680	29·816

TABLE II.  
MEAN TEMPERATURE OF THE AIR, at PORT LEOPOLD, 1848, September, to 1849, August.

Hours.	1848.				1849.								Year.
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	
2 a.m. -	+23·5	+12·0	-10·6	-32·1	-32·1	-31·6	-22·2	-7·3	+13·8	+28·7	+34·1	+31·5	+0·6
4 " -	23·4	12·2	10·6	31·9	31·6	31·7	22·4	7·7	14·1	29·3	34·4	31·4	0·7
6 " -	23·4	12·4	11·0	32·2	31·5	31·6	22·1	7·7	16·3	30·6	35·4	32·6	1·2
8 " -	23·7	12·4	10·9	32·3	31·3	31·4	21·4	6·3	18·6	32·4	36·4	33·5	2·0
10 " -	24·2	12·8	10·5	32·4	30·9	30·5	19·4	4·9	19·6	34·6	37·2	34·5	2·9
Noon -	24·7	12·9	11·1	32·1	31·0	29·7	17·4	3·7	20·8	35·1	38·0	35·2	3·5
2 p.m. -	25·0	12·9	11·0	32·4	30·9	29·6	15·6	2·9	21·9	35·3	38·2	35·2	3·8
4 " -	25·0	12·1	11·1	32·5	32·0	30·4	16·9	2·5	21·5	34·8	37·5	35·0	3·4
6 " -	24·5	11·5	11·6	32·6	32·3	30·8	18·3	3·2	20·1	34·1	37·2	34·4	2·8
8 " -	24·0	11·3	11·6	32·7	32·3	31·5	20·1	4·6	18·3	32·3	36·3	33·6	1·9
10 " -	23·5	10·9	11·6	32·5	32·0	31·9	20·8	5·8	16·6	30·7	35·1	32·2	1·2
Midnight -	+23·4	+10·8	-11·6	-32·6	-32·0	-31·7	-21·7	-6·8	+15·4	+29·5	+34·1	+31·5	+0·7
Means -	+24·0	+12·0	-11·1	-32·4	-31·7	-31·0	-19·9	-5·3	+18·1	+32·3	+36·2	+33·4	+2·1

TABLE III.  
EXTREMES OF ATMOSPHERIC PRESSURE, WITH ACCOMPANYING TEMPERATURE, WIND, AND WEATHER, at PORT LEOPOLD, 1848-9.

Month.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Weather.	Range.
September 1848 -	d. h. 8 0	ins. 30·078	+30	E.S.E. 4	c	d. h. 6 2	ins. 29·294	+27	E. b. N. 8	c q	inch. 0·784
October " -	14 22	·370	+3	N. b. E. 2	o c	17 20	·322	13	S.W. 5	c m q	1·048
November " -	12 20	·263	-16	S. b. E. 4	c	2 18	·312	+16	N.E. 7	o q	0·951
December " -	31 12	·345	34	S.S.E. 6	b e q	22 14	·092	-29	W.N.W. 7	b m q	1·253
January 1849 -	1 4	·420	30	" 6	b	21 8	29·323	39	S. b. E. 5	b q	1·097
February " -	24 16	·571	48	Calm	"	1 14	28·935	-27	N.W. 9	"	1·636
March " -	26 16	·431	12	S.S.E. 4	m	7 8	29·383	+2	E. b. S. 5	b m q	1·048
April " -	13 14	·528	-13	" 1	o m	4 0	·342	-4	W. 6	b e m q	1·186
May " -	13 16	·342	+8	" 4	b e f	24 6	·675	+26	E. b. S. 2	o m	0·667
June " -	8 10	·163	23	N.N.E. 1	b v	14 0	·479	38	S.S.E. 2	b e m	0·684
July " -	25 2	·073	41	" 4	b e q	11 18	·192	35	N. 1	o m s	0·881
August " -	17 10	29·935	+30	N. 3	b e v	1 18	·192	+34	E. 8	c m q r	0·743
Year -	Feb.	30·571	—	—	—	Feb.	28·935	—	—	—	1·636

TABLE IV.  
EXTREMES OF AIR TEMPERATURE, WITH ACCOMPANYING PRESSURE, WIND, AND WEATHER, at PORT LEOPOLD, 1848-9.

Month.	Date.	Max.	Bar.	Wind.	Weather.	Date.	Min.	Bar.	Wind.	Weather.	Range.
September 1848 -	d. h. 1 0	+35	ins. 29·53	W 1	b e	d. h. 29 10	+9	ins. 29·96	N. 1	b e m	26
October " -	27 0	31	·50	S.S.E. 4	o s q m	31 12	-8	30·08	N.W. b. N. 4	o	39
November " -	2 12	+17	·34	N. b. W. 5	c m s	29 6	33	29·72	N.N.W. 2	b	50
December " -	3 16	-12	·84	N.E. 8	b q	15 8	50	29·69	" 1	"	38
January 1849 -	7 2	11	·55	N.W. 3	o g	26 20	44	30·07	N. 1	"	33
February " -	26 18	-15	·57	N.N.W. 6	m	24 18	52	30·57	Calm	"	37
March " -	6 22	+7	·42	S.E. 7	m q	23 18	42	·18	"	"	49
April " -	29 22	10	·91	S.S.E. 1	b e	5 14	22	·03	"	b v	32
May " -	23 2	38	·77	W. 1	o m	0 16	-6	29·98	"	"	44
June " -	24 2	45	·76	S. 2	b e	5 16	+14	·93	N.N.W. 7	b q	31
July " -	4 0	42	·70	N.W. 3	b e v	28 14	32	·63	N.N.E. 2	c m r	10
August " -	19 2	+42	·70	S. b. E. 1	"	11 14	27	29·67	Calm	b e f	15
Year -	June	+45	—	—	—	Feb.	-52	—	—	—	97



TABLE V.  
SUMS OF WIND COMPONENTS, at PORT LEOPOLD, H.M.S. "INVESTIGATOR."

Hours.	September, 1848.				October, 1848.				November, 1848.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
2 a.m.	50.0	14.8	56.1	8.9	44.3	24.9	46.3	25.0	61.0	21.8	7.3	30.7
4 "	47.9	12.8	58.9	9.3	48.3	29.7	47.9	24.3	64.6	23.7	9.5	26.5
6 "	44.6	15.4	63.7	8.9	40.1	34.2	44.5	31.5	71.6	21.5	16.8	26.3
8 "	38.4	13.5	68.2	9.3	38.6	32.6	33.3	28.6	71.9	21.5	18.3	20.4
10 "	51.2	16.5	56.2	13.3	39.1	27.1	35.2	24.5	68.7	14.5	7.1	27.6
Noon	50.8	16.8	59.0	15.0	40.2	26.0	39.7	29.0	67.0	16.4	6.3	34.6
2 p.m.	46.8	15.8	48.6	17.7	45.6	24.2	27.7	32.8	62.6	16.8	10.4	34.1
4 "	49.8	16.9	48.7	18.4	43.8	24.6	26.1	32.4	67.7	15.3	9.9	33.1
6 "	56.0	10.5	59.9	11.4	40.4	21.2	32.9	31.1	62.9	14.2	14.0	31.0
8 "	45.1	8.7	66.8	17.5	46.8	28.2	31.1	37.1	58.8	15.2	11.5	29.0
10 "	55.6	10.1	56.4	9.8	54.5	23.0	34.1	29.8	49.0	22.7	8.4	37.9
Midnight	63.2	13.2	56.7	11.7	64.4	23.6	34.5	33.5	50.6	23.7	11.2	34.8
Means	49.9	13.7	58.3	12.6	45.5	26.6	36.1	30.0	63.0	18.9	10.9	30.5

(continued.)

Hours.	December, 1848.				January, 1849.				February, 1849.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
2 a.m.	43.5	34.8	13.8	22.3	55.4	37.4	21.1	26.9	72.7	46.3	19.7	46.2
4 "	40.9	35.5	20.2	22.8	59.9	43.0	21.6	29.4	70.7	44.5	17.2	46.9
6 "	47.5	34.8	17.5	13.7	62.1	40.0	17.2	28.8	80.4	45.4	17.5	33.8
8 "	44.0	32.8	16.8	12.6	57.9	33.6	16.9	27.0	71.2	41.4	22.0	25.2
10 "	44.0	32.8	20.6	18.4	57.1	33.3	14.3	23.3	68.9	44.9	13.0	33.6
Noon	37.9	27.5	21.0	14.2	63.5	36.7	16.7	26.1	63.7	41.1	22.3	35.3
2 p.m.	39.6	27.2	25.3	12.0	58.7	35.3	15.3	19.9	59.0	47.5	27.7	35.6
4 "	40.3	24.7	18.2	12.3	61.4	34.3	14.8	31.0	55.5	47.3	27.2	45.5
6 "	36.9	22.8	12.0	13.4	60.5	28.4	17.1	31.9	63.9	43.0	24.4	51.4
8 "	33.9	24.1	7.7	18.6	59.2	29.0	15.5	28.8	66.7	47.2	25.0	53.9
10 "	31.4	28.9	10.6	19.3	54.1	32.4	11.0	26.8	65.4	47.7	17.6	48.6
Midnight	34.1	29.1	14.4	16.9	54.3	32.8	11.2	32.8	68.5	46.2	22.2	50.2
Means	39.5	29.6	16.5	16.4	58.7	34.7	16.1	27.7	67.2	45.2	21.3	42.2

TABLE V. (continued).  
SUMS OF WIND COMPONENTS, at PORT LEOPOLD, H.M.S. "INVESTIGATOR"—continued.

Hours.	March, 1849.				April, 1849.				May, 1849.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
2 a.m.	46.9	33.4	41.8	20.4	55.2	23.5	25.8	15.9	41.6	18.8	34.0	21.1
4 "	55.2	29.7	36.7	23.3	60.3	18.7	26.9	14.7	45.5	19.5	30.0	31.0
6 "	59.4	28.5	30.7	18.8	71.9	21.5	21.0	16.4	51.8	22.9	26.4	21.6
8 "	54.4	33.8	26.4	20.8	64.4	21.8	27.4	18.4	49.8	24.8	25.3	19.4
10 "	54.7	36.8	26.2	19.3	63.9	25.3	38.0	17.3	56.5	23.6	30.3	15.4
Noon	61.0	38.4	26.0	17.8	65.2	20.9	34.0	23.0	52.4	33.2	29.6	15.7
2 p.m.	61.9	32.8	33.0	18.8	72.7	22.3	36.3	19.6	49.8	31.4	19.4	18.5
4 "	60.0	33.2	39.6	17.3	76.6	20.6	39.9	15.6	49.1	29.1	19.0	19.2
6 "	54.8	27.5	42.7	21.0	73.6	23.8	28.5	20.2	46.7	21.8	27.3	15.4
8 "	55.3	31.4	43.0	22.5	63.5	18.0	25.6	22.3	48.2	23.9	27.6	19.3
10 "	50.3	39.3	44.3	21.8	55.3	21.0	17.2	21.4	40.7	26.1	32.2	19.2
Midnight	47.1	36.1	41.9	27.6	50.0	21.7	19.2	19.4	42.6	22.4	36.3	19.5
Means	55.1	33.4	36.0	20.8	64.4	21.6	28.3	18.7	47.9	24.8	28.1	19.6

(continued.)

Hours.	June, 1849.				July, 1849.				August, 1849.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
2 a.m.	41.2	22.0	45.1	18.4	58.2	12.8	12.7	43.5	36.9	26.6	24.1	29.2
4 "	46.7	29.2	50.0	15.4	62.9	12.6	14.5	43.9	37.8	27.8	25.9	36.2
6 "	47.0	25.6	44.9	12.8	61.9	10.7	21.1	38.1	45.0	23.2	30.4	27.8
8 "	45.7	24.0	33.8	19.2	62.2	13.9	21.5	39.2	41.2	22.0	35.4	27.5
10 "	39.5	26.4	35.8	21.2	66.8	7.4	16.8	34.7	40.2	21.5	17.9	38.6
Noon	43.9	25.8	35.9	24.2	71.4	6.9	17.0	27.3	48.2	22.2	16.9	33.4
2 p.m.	44.1	25.9	43.5	20.6	74.4	7.8	16.7	22.8	40.4	22.2	25.8	27.1
4 "	44.0	24.8	36.4	21.1	73.9	9.8	16.5	28.0	33.0	25.9	32.1	28.9
6 "	44.5	24.1	31.4	22.8	69.9	13.3	15.7	38.4	31.7	34.2	34.7	25.1
8 "	44.6	26.3	39.6	19.8	66.2	13.3	18.4	38.7	33.7	27.4	17.8	28.5
10 "	40.4	24.2	42.9	18.8	69.0	8.7	13.9	36.9	28.5	25.4	16.4	17.9
Midnight	41.5	27.3	38.3	18.9	59.9	13.2	9.7	42.8	39.2	25.0	30.3	23.5
Means	43.6	25.5	39.8	19.4	66.4	10.9	16.2	36.2	38.0	25.3	25.6	28.6



TABLE VI.  
SUMS OF WIND COMPONENTS WITH RESULTANT WINDS,  
at PORT LEOPOLD, H.M.S. "INVESTIGATOR," for  
the Year 1848 September, to 1849 August.

Hours.	Components.				Resultants.	
	N.	S.	E.	W.	Direction.	Force.*
2 a.m.	606.9	317.1	347.8	308.5	N. 8 E.	293
4 "	640.7	326.7	359.3	323.7	N. 6 E.	320
6 "	683.3	323.9	351.7	278.5	N. 12 E.	360
8 "	639.7	315.7	345.3	267.6	N. 13 E.	340
10 "	650.6	310.1	310.4	287.2	N. 4 E.	344
Noon	665.2	311.9	324.4	295.6	N. 5 E.	354
2 p.m.	655.6	309.2	329.7	279.5	N. 8 E.	350
4 "	655.1	306.5	328.4	301.8	N. 4 E.	350
6 "	641.8	284.8	340.6	313.1	N. 4 E.	360
8 "	622.0	292.7	329.6	336.0	N. 1 W.	330
10 "	594.2	309.5	305.0	308.2	N. 1 W.	285
Midnight	615.4	314.3	325.9	331.6	N. 1 W.	301
Means	639.2	310.2	333.2	302.6	N. 5 E.	330

\* These figures must be divided by 365, to get the mean force at the given hour.

TABLE VII.  
MONTHLY RESULTANTS OF THE WINDS,  
at PORT LEOPOLD, H.M.S.  
"INVESTIGATOR."

Month.	Resultants.	
	Direction.	Force.†
September 1848	N. 52 E.	1.93
October "	N. 18 E.	0.64
November "	N. 24 W.	1.61
December "	N.	0.32
January 1849	N. 26 W.	0.85
February "	N. 43 W.	1.08
March "	N. 35 E.	0.85
April "	N. 13 E.	1.47
May "	N. 20 E.	0.79
June "	N. 48 E.	0.90
July "	N. 20 W.	1.90
August "	N. 14 W.	0.42

† Force by Beaufort's scale.

TABLE VIII.  
CALMS NOTED at PORT LEOPOLD, H.M.S. "INVESTIGATOR," 1848 September,  
to 1849 August.

Hours.	1848.				1849.									Year.
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.		
2 a.m. -	-	2	4	3	2	1	1	4	3	3	2	1	1	27
4 „ -	-	2	3	2	1	1	1	3	2	5	2	1	3	26
6 „ -	-	1	1	—	4	2	3	4	1	3	2	—	2	23
8 „ -	-	3	1	2	5	1	2	2	3	3	1	1	—	24
10 „ -	-	1	3	—	1	1	1	2	1	1	2	—	2	15
Noon -	-	—	1	—	—	1	3	2	—	1	2	—	—	10
2 p.m. -	-	4	—	—	—	1	2	2	1	1	1	—	2	14
4 „ -	-	3	—	—	1	2	1	1	1	—	1	—	1	11
6 „ -	-	1	3	—	1	3	1	1	1	1	1	—	1	14
8 „ -	-	1	3	2	4	3	1	2	2	—	—	—	2	20
10 „ -	-	2	3	4	4	2	1	—	3	2	—	—	—	21
Midnight	-	—	4	3	5	1	1	1	2	3	1	1	—	22
Means -	-	1.7	2.2	1.3	2.3	1.6	1.5	2.2	1.7	1.9	1.2	0.3	1.2	227

TABLE IX.  
SUMMARY OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12),  
at PORT LEOPOLD, H.M.S. "INVESTIGATOR."

Months.	Total Observa- tions.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.						
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.					
September	1848.	-	-	-	-	360	24	2.4	22	3.3	103	4.1	55	3.9	18	3.9	9	5.9	14	3.7	4	3.0
October	-	-	-	-	-	372	41	2.2	12	2.5	7	3.9	9	4.9	21	5.6	22	6.2	26	5.1	16	4.0
November	-	-	-	-	-	360	69	2.8	19	2.2	8	5.5	—	—	—	—	—	—	7	5.6	33	4.4
December	-	-	-	-	-	372	42	2.1	42	3.2	8	5.5	2	6.0	—	—	—	—	7	2.9	69	3.4
January	1849.	-	-	-	-	372	52	3.5	12	4.0	3	1.3	1	2.0	3	1.7	1	3.0	10	4.8	72	4.7
February	-	-	-	-	-	336	35	3.3	5	5.2	2	5.5	—	—	3	5.3	1	8.0	16	4.6	72	6.0
March	-	-	-	-	-	372	41	3.8	39	4.0	3	2.7	2	6.5	29	6.8	5	6.8	5	4.8	75	3.7
April	-	-	-	-	-	360	56	3.3	64	4.5	12	4.2	—	—	9	6.9	7	8.4	5	2.6	61	2.9
May	-	-	-	-	-	372	30	2.4	43	3.6	10	1.7	5	4.2	24	4.6	9	2.8	5	3.2	79	3.2
June	-	-	-	-	-	360	42	2.0	32	1.9	12	2.4	18	4.8	35	4.1	26	4.3	17	2.7	61	3.1
July	-	-	-	-	-	372	80	2.3	41	2.3	8	2.6	10	5.4	3	9.0	4	3.5	4	3.0	39	3.0
August	-	-	-	-	-	372	67	3.0	16	2.4	5	2.8	4	4.5	13	6.5	16	5.4	29	3.2	36	2.8

(continued.)

Months.			S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		Calms.
			O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
September	-	-	15	2'9	5	2'4	18	3'0	5	2'2	8	3'7	7	5'1	10	3'3	14	3'1	9	1'8	20
October	-	-	15	6'0	2	3'5	6	3'0	4	4'0	6	1'8	18	2'6	81	3'5	59	3'1	1	1'0	26
November	-	-	15	3'9	1	6'0	—	—	—	—	1	1'0	11	5'0	90	3'1	88	3'3	2	1'5	16
December	-	-	28	3'0	11	2'5	9	2'0	3	1'0	10	1'1	7	3'9	49	2'5	57	2'5	—	—	28
January	-	-	20	3'0	3	3'0	1	1'0	1	1'0	5	1'8	14	3'9	51	3'6	101	3'4	3	1'7	19
February	-	-	15	5'5	—	—	5	1'4	—	—	5	4'2	14	8'0	44	6'5	97	4'6	4	2'5	18
March	-	-	40	2'5	3	2'3	3	2'0	1	3'0	3	4'3	4	2'0	37	4'8	51	4'3	5	2'4	26
April	-	-	22	2'5	2	3'0	1	1'0	—	—	4	4'0	—	—	41	5'4	54	2'4	2	1'5	20
May	-	-	20	3'0	—	—	2	2'0	2	1'0	8	2'0	2	2'0	31	5'2	68	3'5	11	1'3	23
June	-	-	11	2'7	2	5'5	6	4'0	—	—	1	1'0	—	—	31	5'6	49	4'5	2	1'5	15
July	-	-	4	2'0	1	2'0	—	—	1	1'0	4	3'7	14	4'5	99	4'3	54	3'0	2	1'0	4
August	-	-	28	2'4	9	2'2	11	2'5	4	2'7	11	2'8	22	5'0	51	3'9	26	2'9	10	1'9	14



TABLE X.  
SUMMARY OF WEATHER NOTATIONS, at PORT LEOPOLD, H.M.S. "INVESTIGATOR."

Hours.	September, 1848.								October, 1848.								November, 1848.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
2 a.m.	3	9	18	4	2	—	9	1	4	9	18	8	—	—	5	9	16	12	2	6	—	—	1	7
4 "	3	9	18	4	2	—	8	1	3	9	19	8	—	—	4	9	17	11	2	5	—	—	1	5
6 "	5	5	20	1	1	—	7	—	4	8	19	5	1	—	6	9	17	10	3	4	—	—	1	8
8 "	5	6	19	1	—	—	5	—	6	8	17	5	1	—	6	8	14	12	4	4	—	—	1	8
10 "	5	9	16	2	—	—	5	—	6	9	16	8	—	—	9	9	13	12	5	7	—	—	1	6
Noon	5	10	15	2	—	—	3	—	5	10	16	8	—	—	10	8	13	13	4	8	—	—	1	7
2 p.m.	4	11	15	4	2	—	4	1	4	14	13	9	—	—	6	4	13	10	7	9	—	—	2	7
4 "	4	10	16	4	1	—	3	1	5	13	13	9	—	—	4	4	11	14	5	9	—	—	2	7
6 "	4	7	19	2	—	—	6	3	5	9	17	8	—	—	5	5	13	8	9	9	—	—	2	6
8 "	4	4	22	1	—	—	6	3	8	7	16	7	—	—	5	4	13	11	6	9	—	—	2	6
10 "	3	7	20	5	1	—	8	1	7	9	15	6	—	—	8	9	14	10	6	7	—	—	1	7
Mdn.	3	5	22	6	1	—	8	1	5	8	18	5	—	—	8	11	14	9	7	9	—	—	2	8
Means	4.0	7.7	18.3	3.0	0.8	—	6.0	1.0	5.2	9.4	16.4	7.2	0.2	—	6.3	7.4	14.0	11.0	5.0	7.2	—	—	1.4	6.8

(continued.)

Hours.	December, 1848.								January, 1849.								February, 1849.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
2 a.m.	23	7	1	3	—	—	—	7	27	3	1	1	—	—	—	9	15	6	7	14	—	—	—	14
4 "	23	7	1	3	—	—	—	7	26	4	1	3	—	—	—	9	16	5	7	12	—	—	—	15
6 "	23	6	2	2	—	—	—	6	25	4	2	6	—	—	1	14	16	6	6	13	—	—	—	12
8 "	22	7	2	—	—	—	—	5	25	4	2	6	—	—	1	14	15	8	5	15	—	—	—	14
10 "	19	8	4	3	—	—	—	5	19	11	1	9	—	—	1	7	13	6	9	14	—	—	1	12
Noon	18	10	3	1	—	—	—	4	20	10	1	9	—	—	1	8	12	8	8	13	—	—	1	12
2 p.m.	19	10	2	3	—	—	—	6	20	9	2	5	—	—	—	7	13	7	8	17	—	—	1	14
4 "	20	9	2	3	—	—	—	5	21	8	2	5	—	—	—	8	13	8	7	15	—	—	—	14
6 "	20	7	4	4	—	—	—	3	23	7	1	3	—	—	—	12	14	10	4	16	—	—	—	15
8 "	20	10	1	5	—	—	—	4	22	8	1	3	—	—	—	11	14	9	5	13	—	—	1	13
10 "	20	8	3	5	—	—	—	3	22	8	1	4	—	—	—	8	14	10	4	15	—	—	—	12
Mdn.	22	6	3	6	—	—	—	4	24	7	—	4	—	—	—	8	14	8	6	15	—	—	—	11
Means	20.8	7.9	2.3	3.2	—	—	—	4.9	22.8	6.9	1.3	4.8	—	—	0.3	9.6	14.1	7.6	6.3	14.3	—	—	0.3	13.2

TABLE X. (continued).  
SUMMARY OF WEATHER NOTATIONS, at PORT LEOPOLD, H.M.S. "INVESTIGATOR."—continued.

Hours.	March, 1849.								April, 1849.								May, 1849.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
2 a.m.	18	6	7	12	—	—	2	9	12	12	6	8	—	—	4	5	7	8	16	8	—	—	7	3
4 "	17	6	8	12	—	—	3	10	12	11	7	10	—	—	4	5	7	5	19	9	1	—	7	6
6 "	16	7	8	10	—	—	4	7	11	13	6	13	—	—	3	5	8	5	18	12	1	—	6	6
8 "	17	8	6	10	—	—	4	6	11	12	7	14	—	—	3	4	9	4	18	12	1	—	6	6
10 "	18	8	5	10	—	—	2	9	11	13	6	18	—	—	3	6	9	9	13	14	—	—	6	4
Noon	18	8	5	10	—	—	2	8	11	13	6	15	—	—	3	7	7	10	14	16	—	—	6	4
2 p.m.	16	8	7	12	—	—	2	9	12	11	7	14	—	—	2	6	6	9	16	16	—	—	4	2
4 "	15	8	8	13	—	—	2	9	11	12	7	14	—	—	2	5	8	9	14	12	—	—	5	5
6 "	17	8	6	10	—	—	3	8	8	15	7	15	—	—	6	3	6	10	15	11	—	—	9	3
8 "	17	8	6	10	—	—	2	9	11	12	7	12	—	—	4	6	8	10	13	10	—	—	8	2
10 "	17	9	5	10	—	—	—	10	11	12	7	12	—	—	4	5	7	10	14	11	—	—	7	4
Mdn.	17	9	5	10	—	—	—	10	12	12	6	8	—	—	3	5	7	10	14	10	—	—	9	4
Means	16.9	7.8	6.3	10.7	—	—	2.2	8.7	11.1	12.3	6.6	12.7	—	—	3.4	5.2	7.4	8.3	15.3	11.2	0.2	—	6.7	4.1

(continued.)

Hours.	June, 1849.								July, 1849.								August, 1849							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
2 a.m.	8	7	15	14	2	—	7	5	5	17	9	15	—	3	5	9	6	15	10	11	2	1	3	5
4 "	7	11	12	10	2	—	5	7	4	20	7	19	—	1	6	6	8	11	12	9	5	1	2	4
6 "	4	8	18	18	2	—	5	6	3	18	10	19	—	2	4	7	6	10	15	8	5	5	2	7
8 "	4	10	16	16	1	—	6	7	4	16	11	17	—	1	2	4	7	15	9	12	3	5	1	6
10 "	4	12	14	16	—	1	4	7	3	16	12	17	—	4	4	6	8	11	12	9	4	4	2	5
Noon	5	11	14	14	—	2	1	7	5	17	9	17	—	4	1	5	7	15	9	10	4	4	—	7
2 p.m.	7	15	8	8	—	1	2	6	6	19	6	15	—	4	1	4	8	17	6	13	1	4	—	4
4 "	6	13	11	12	—	1	3	5	5	20	6	17	—	3	2	5	7	17	7	14	1	3	—	3
6 "	5	13	12	12	—	1	5	6	4	19	8	15	—	2	2	4	7	15	9	12	—	4	2	6
8 "	4	14	12	13	—	1	4	7	5	21	5	13	—	3	1	3	9	15	7	8	1	2	1	4
10 "	6	10	14	11	1	—	4	5	5	19	7	12	—	4	2	6	8	15	8	11	1	2	—	4
Mdn.	6	11	13	11	1	—	3	7	5	15	11	14	—	4	5	7	7	13	11	10	2	6	—	5
Means	5.5	11.3	13.2	12.9	0.	0.6	4.1	6.2	4.5	18.1	8.4	15.8	—	2.9	2.9	5.5	7.3	14.1	9.6	10.6	2.4	3.4	1.1	5.0



No. XX.

Results of Meteorological Observations made in Wolstenholm Sound.

H.M.S. "NORTH STAR," commanded by James Saunders, R.N., in endeavouring to reach Lancaster Sound, on July 29th, 1849, was beset in the ice at the east side of Melville Bay, and gradually drifted from day to day until on September 26th she was abreast of Wolstenholm Island; when the ice opening a little, and Wolstenholm Sound being clear, all sail was made and the vessel pressed through, anchoring in the lower part of the Sound that evening. On October 1st she arrived in North Star Bay (latitude 76° 34' N., longitude 68° 45' W.), where she remained throughout the winter. It is high water in the bay, full and change, at 11h. 8m., rise 7½ feet.

The meteorological data for this discussion have been furnished by the captain's log (No. 2610); and mistakes and doubtful entries in it have been checked by the master's log (No. 311), kept by John Way, R.N. The former was lent by the Admiralty Record Office, the latter by the Public Record Office.

It has been assumed that the true direction of the wind was recorded while the ship was frozen up, but that in August and September while drifting in the pack the winds were observed by the compass, and accordingly they have been corrected for 9 points westerly variation.

No information can now be had regarding the instruments which were supplied for this voyage. A note in the log, December 16th, states: "Quicksilver froze on the ice quite solid at -47°." Taking this to have been the freezing point of mercury by the thermometer on the ice, its error was -47° - (-38°) = -9°, hence correction +9°. On March 1st, a note states: "Quicksilver on board froze quite solid, thermometer -42°." Taking this to have been the freezing point of mercury by the thermometer on board, or that by which the air temperature was observed, its error was -42° - (-38°) = -4°, hence correction +4°. It may be assumed that these two thermometers were correct at the freezing point of water, so that their errors may be proportioned along the scale as follows:—

CORRECTIONS FOR THERMOMETERS.

Where.	-48°.	-38°.	-28°.	-18°.	-8°.	+2°.	+12°.	+22°.	+32°.
On ice -	+9°0	+7°9	+6°8	+5°7	+4°6	+3°5	+2°4	+1°3	+0°2
On board -	+4°0	+3°5	+3°0	+2°5	+2°0	+1°5	+1°0	+0°5	+0°0

As a test of the reliance to be put on these corrections, the observations made on the ice 300 yards from the ship, between 21st and 28th February, were compared with those taken on board as follows:—

Means of 8 Days.	4 a.m.	8 a.m.	Noon.	4 p.m.	8 p.m.	Midnight.
On board -	-50°8	-49°3	-45°3	-48°9	-49°4	-48°0
Correction -	+4°1	+4°0	+3°9	+4°0	+4°1	+4°0
	-46°7	-45°3	-41°4	-44°9	-45°3	-44°0
On ice -	-55°5	-53°4	-49°8	-52°6	-54°0	-52°4
Correction -	+9°8	+9°6	+9°2	+9°5	+9°7	+9°5
	-45°7	-43°8	-40°6	-43°1	-44°3	-42°9

This makes the floe warmer than the ship by 1°·2, while without these corrections the floe would be colder by 4°·3.

Similar observations, taken on the ice 100 yards from the ship, from March 1st to 22nd, give as follows:—

Means of 22 Days.	4 a.m.	8 a.m.	Noon.	4 p.m.	8 p.m.	Midnight.
On board -	-26°6	-27°3	-21°0	-23°5	-25°2	-27°0
Correction -	+2°9	+3°0	+2°6	+2°8	+2°9	+3°0
	-23°7	-24°3	-18°4	-20°7	-22°3	-24°0
On ice -	-27°5	-28°0	-21°9	-24°0	-25°1	-26°7
Correction -	+6°8	+6°8	+6°1	+6°4	+6°5	+6°7
	-20°7	-21°2	-15°8	-17°6	+18°6	-20°0

These again make the floe warmer by 3°·3, while without the corrections it would be colder by 0°·3. The temperature of the air on and near the ship has usually been found to be higher than that of the open air on the floe; hence it must be inferred that the freezing temperatures were not accurately observed in both instances. However, the error of the thermometer used on board was evidently too large to be neglected, accordingly the corrections deduced for it have been applied to the results of the observations given here.

Table I. shows the four-hourly average readings of an aneroid in each month, uncorrected in any way; they must therefore be received with reserve, and used only as approximations. They show that the monthly pressure was greatest in March and



least in February; and that on the whole year there was a diurnal range having a maximum about 8 p.m., and a minimum about 8 a.m., but how much this was affected by the temperature of the aneroid cannot be stated.

Table II. contains the results of the thermometrical observations registered on board the ship, corrected for the probable errors of the instrument. July was the warmest month,  $39^{\circ} \cdot 8$ ; February the coldest,  $-30^{\circ} \cdot 6$ ; and the mean temperature of the year was  $5^{\circ} \cdot 6$ . In December and January the mean diurnal range of temperature was very small. It was largest in April.

Table III. gives the extreme readings of the aneroid in each month, with the accompanying temperature of the air, wind, and weather. The extremes range from  $30 \cdot 92$  in March to  $28 \cdot 60$  in February, or through  $2 \cdot 32$  inches.

Table IV. shows the monthly maximum and minimum temperature of the air, with the accompanying reading of the aneroid, the wind and weather. The maximum temperature of the year,  $55^{\circ}$ , occurred in July, the minimum,  $-54^{\circ}$ , in February, so that the absolute range was  $109^{\circ}$ . The greatest range in any month was  $76^{\circ}$  in March, the least  $24^{\circ}$  in August. The winds were calm or light, and the weather clear with the low temperatures; but the high temperatures sometimes occurred with squally stormy weather.

Table V. contains the sums of the wind components.

Table VI. summarises the results in Table V. for the whole year and from it the four-hourly resultants of the winds have been deduced. These show a change in the azimuth of the wind from S.  $29^{\circ}$  E. at 8 a.m., to S.  $6^{\circ}$  W. at 8 p.m.; and the greatest force at 4 a.m., and the least at 4 p.m. The resultant for the year is S.  $9^{\circ}$  E., with a force of 0.7 of Beaufort's scale.

Table VII. gives the monthly resultants of the winds computed from the means of the wind components contained in Table V. The directions are all from the southward, and suggest some local cause. By referring to Admiralty chart, No. 275, which gives a plan of North Star Bay, it will be seen that Mount Dundas rises to 616 feet, and was distant about four miles W.N.W. of the ship, whilst two miles distant to the S.W. there was also high land.

Table VIII. contains the monthly summaries of the winds. The most frequent winds were from the eastward, except in July, when they were from N.W.; there is little or no agreement between the direction of greatest frequency and the direction of the resultant for the various months. Calms were frequent, especially in November.

Table IX. summarises the weather notations according to the month and the hours of observations. The most overcast weather occurred in August, the most frequent clear weather in January. Fogs were frequent in June, July, August. Rain fell on 17 days, and snow on 66, or precipitation took place only on 83 days during the year.

Wind of force 8 and upwards occurred 7 times in August, 25 in September, 2 in October, 0 in November, 6 in December, 2 in January, 20 in February, 8 in March, 9 in April, 14 in May, 19 in June, 4 in July.

TABLE I.

MEAN READINGS OF ANEROID, in WOLSTENHOLM SOUND, 1849 August, to 1850 July.

Hour.	1849.					1850.							Year.
	Aug.	Sept.	Oct.	Nov.*	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	
4 a.m. -	inches. 29.774	inches. 29.734	inches. 29.608	inches. 29.807	inches. 29.635	inches. 29.828	inches. 29.323	inches. 29.993	inches. 29.694	inches. 29.831	inches. 29.621	inches. 29.591	inches. 29.703
8 „ -	.762	.745	.603	.805	.624	.825	.340	.986	.686	.832	.614	.595	.701
Noon -	.764	.765	.605	.830	.666	.842	.387	30.002	.688	.829	.621	.600	.713
4 p.m. -	.784	.784	.598	.848	.704	.852	.395	.005	.725	.832	.638	.598	.730
8 „ -	.791	.790	.618	.853	.701	.875	.408	30.012	.758	.840	.636	.611	.741
Midnight -	.778	.778	.596	.822	.685	.848	.372	29.987	.745	.839	.627	.600	.723
Means -	29.775	29.766	29.605	29.828	29.669	29.845	29.371	29.998	29.716	29.834	29.626	29.599	29.719

TABLE II.

MEAN TEMPERATURE OF THE AIR, in WOLSTENHOLM SOUND, 1849 August, to 1850 July.

Hour.	1849.					1850.							Year.
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	
4 a.m. -	32.1	25.3	12.6	-16.9	-23.9	-22.2	-31.3	-17.0	-8.4	22.5	36.2	37.0	3.8
8 „ -	33.6	26.4	12.6	15.1	23.6	21.9	30.2	16.9	5.5	23.9	37.5	38.5	5.0
Noon -	35.7	29.0	14.0	14.7	23.9	21.4	29.2	12.1	-0.9	26.0	40.5	40.3	6.9
4 p.m. -	35.7	29.0	12.3	16.4	24.7	22.2	31.1	13.1	+3.3	29.5	43.3	43.3	7.4
8 „ -	33.7	27.0	12.0	16.8	24.9	22.6	31.3	15.6	+0.1	28.4	41.7	41.8	6.1
Midnight -	32.1	25.4	12.1	-17.7	-23.9	-23.3	-30.8	-16.7	-6.8	23.3	37.2	37.7	4.0
Mean -	33.8	27.0	12.6	-16.3	-24.1	-22.3	-30.6	-15.2	-3.0	25.6	39.4	39.8	5.6



TABLE III.

EXTREME READINGS OF ANEROID, with accompanying TEMPERATURE of the AIR, WIND, and WEATHER, in WOLSTENHOLM SOUND, 1849 August, to 1850 July.

Month.	Date.		Highest.	Temp.	Wind.	Weather.	Date.		Lowest.	Temp.	Wind.	Weather.	Range.
	d.	h.	inches.	°			d.	h.	inches.	°			inch.
September 1849 -	6	16	30.17	34	E. b. S. 2	o c m	22	20	29.32	30	S.E. b. S. 2	b c f	0.85
October " -	30	8	.37	28	Calm	b c	17	0	.00	21	W. b. N. 4	b c	1.37
November " -	1	0	.32	30	"	"	19	4	.02	10	S.W. 1	s	1.30
December " -	4	0	.57	-4	S.E. 1	b	28	12	29.25	-31	Calm	b	1.32
January 1850 -	26	4	.72	-19	Calm	"	30	0	28.86	-14	S. 11	g s q	1.86
February " -	15	8	.40	-26	"	b c	7	20	.99	-32	E. b. S. 1	b	1.41
March " -	20	12	.04	-39	"	b	13	16	.60	-25	S.E. 1	b m	1.44
April " -	24	8	.92	-20	W. 1	"	5	8	28.82	-20	N.N.E. 2	o s	2.10
May " -	29	12	.12	12	N. 2	o s	19	0	29.10	-8	E. 1	b c	1.02
June " -	1	8	.35	14	W. 5	b c	18	16	.36	32	N. 2	b c q	0.99
July " -	2	12	.05	28	W.N.W. 1	b	28	12	29.21	41	"	c	0.84
August " -	20	4	29.99	46	Calm	o f	12	0	28.81	41	N.E. 1	"	1.18
Year -	March		30.92	—	—	—	Feb.		28.60	—	—	—	2.32

TABLE IV.

EXTREMES OF AIR TEMPERATURE, with accompanying READING of ANEROID, WIND, and WEATHER, in WOLSTENHOLM SOUND, 1849 August, to 1850 July.

Month.	Date.		Max.	Aneroid.	Wind.	Weather.	Date.		Min.	Aneroid.	Wind.	Weather.	Range.
	d.	h.	°	inches.			d.	h.	°	inches.			°
August 1849 -	17	0	46	29.50	S.E. b. E. 5	b c	29	12	22	29.68	W. b. S. 1	o f	24
September " -	28	0	41	30.30	E. b. S. 11	b c q	15	16	6	.49	N.W. b. N. 2	b c	35
October " -	3	0	32	30.29	E.N.E. 1	b	27	16	-24	29.68	Calm	b	56
November " -	8	0	11	29.80	S. 2	o s	22	4	-41	30.03	"	b c	52
December " -	6	16	8	.68	E. 2	"	10	8	-49	29.89	"	"	57
January 1850 -	24	20	8	.70	S.E. 7	o q	12	0	-41	30.04	"	b	49
February " -	4	8	-2	29.05	S.W. 10	"	23	16	-54	28.96	"	b c	52
March " -	27	20	25	30.12	S. 2	"	1	16	-51	29.86	"	b	76
April " -	29	4	31	29.95	N. 8	c q	4	16	-27	29.78	N.E. 1	"	58
May " -	25	4	42	.73	W.N.W. 1	b c	2	12	+2	30.24	E. 1	"	40
June " -	6	8	52	.61	Calm	b	0	16	24	29.80	S. 3	c q	28
July " -	25	4	55	.80	"	b c	11	8	28	29.20	N.N.W. 1	b c	27
Year -	July		55	—	—	—	Feb.		-54	—	—	—	109

TABLE V.

SUMS OF WIND COMPONENTS, in WOLSTENHOLM SOUND, 1849 August, to 1850 July.

Hour.	August 1849.				September 1849.				October 1849.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m. -	17.3	34.6	72.5	5.1	24.1	46.9	85.8	9.8	11.7	36.3	6.8	28.5
8 " -	10.2	33.4	75.2	3.7	10.8	52.6	94.1	9.1	12.5	27.4	14.3	20.7
Noon -	11.7	46.7	49.5	5.5	17.7	59.7	86.7	11.6	5.1	22.0	13.2	15.6
4 p.m. -	13.6	27.1	42.9	8.6	21.6	45.3	70.5	10.8	3.9	29.9	7.1	21.8
8 " -	12.4	34.9	46.7	10.4	18.5	40.2	71.5	24.2	12.4	32.3	10.1	12.8
Midnight -	8.5	35.8	63.9	8.4	28.4	48.8	72.5	17.3	3.6	46.1	4.0	29.3
Means -	12.3	35.4	58.5	7.0	20.2	48.9	80.2	13.8	8.2	32.3	9.3	21.4

(continued.)

Hour.	November 1849.				December 1849.				January 1850.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m. -	1.1	18.7	3.0	12.0	10.7	21.9	13.4	10.7	3.8	18.6	12.6	6.7
8 " -	8.9	8.8	6.0	11.9	14.0	24.5	12.3	14.5	2.2	18.3	18.5	4.1
Noon -	8.5	8.5	9.8	4.2	9.0	28.4	17.5	6.9	3.0	14.3	19.7	2.8
4 p.m. -	2.2	7.5	16.5	6.9	6.7	25.3	18.5	6.9	11.5	11.9	14.8	3.6
8 " -	0.8	1.8	6.6	3.8	4.9	19.0	15.5	7.2	6.0	13.9	13.4	21.4
Midnight -	1.1	8.8	7.5	4.6	9.4	26.9	13.2	9.8	3.3	9.4	12.4	9.2
Means -	3.8	9.0	8.2	7.2	9.1	24.3	15.1	9.3	5.0	14.4	15.2	8.0

(continued.)

Hour.	February 1850.				March 1850.				April 1850.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m. -	6.4	58.1	8.5	32.4	8.3	33.1	15.7	20.7	6.9	24.5	11.2	23.7
8 " -	7.9	41.5	20.5	20.2	4.5	20.7	20.0	10.3	7.0	18.8	17.5	20.6
Noon -	13.2	22.9	16.4	27.9	0.7	23.5	16.8	15.7	5.7	12.7	11.4	25.4
4 p.m. -	8.4	25.8	25.4	14.9	4.9	24.6	18.7	21.0	10.5	24.2	9.4	23.3
8 " -	3.6	30.0	14.3	23.9	4.0	31.3	15.7	28.1	3.9	23.4	15.4	23.4
Midnight -	2.0	42.8	17.6	24.6	3.9	30.7	16.7	19.1	10.0	21.3	11.2	15.6
Means -	6.9	36.9	17.1	24.0	4.4	27.3	17.3	19.1	7.3	20.8	12.7	22.0



TABLE V. (*concluded*).SUMS OF WIND COMPONENTS, in WOSTENHOLM SOUND, 1849 August, to 1850 July—*cont.*

Hour.	May 1850.				June 1850.				July 1850.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	7.5	40.2	12.3	44.6	5.5	46.5	16.5	19.4	20.7	33.2	9.5	31.4
8 "	8.6	32.9	13.6	27.1	5.8	43.6	14.9	27.7	22.1	25.7	9.6	16.3
Noon	4.3	52.1	5.2	59.2	13.1	39.9	12.9	36.1	22.3	19.4	14.1	19.6
4 p.m.	6.8	50.0	14.2	54.9	19.1	49.6	9.9	28.1	19.2	10.0	7.2	30.1
8 "	8.3	39.6	8.1	37.5	9.7	41.5	7.0	30.4	20.3	18.6	6.4	31.6
Midnight	10.3	37.3	8.3	45.5	13.9	43.2	15.3	21.5	19.3	23.2	14.2	21.2
Means	7.6	42.0	10.3	44.8	11.2	44.1	12.7	27.2	20.7	21.7	10.2	25.0

TABLE VI.

SUMS OF WIND COMPONENTS AND RESULTANT WINDS, in WOLSTENHOLM SOUND, for the Year 1849 August, to 1850 July.

Hour.	Components.				Resultants.	
	N.	S.	E.	W.	Direction.	Force.*
4 a.m.	124.0	412.6	267.8	245.0	S. 4 E.	289
8 "	114.5	348.2	316.5	186.2	S. 29 E.	267
Noon	114.3	350.1	273.2	230.5	S. 10 E.	240
4 p.m.	128.4	331.2	255.1	230.9	S. 7 E.	204
8 "	104.8	326.5	231.7	254.7	S. 6 W.	223
Midnight	113.7	374.3	256.8	226.1	S. 7 E.	262
Means	116.6	357.1	266.8	228.9	S. 9 E.	243

\* These figures must be divided by 365 to obtain the mean force by the Beaufort scale.

TABLE VII.

MONTHLY RESULTANTS OF THE WINDS, in WOLSTENHOLM SOUND, 1849 August, to 1850 July.

Month.	Resultants.	
	Direction.	Force.†
August 1849	S. 66 E.	1.80
September "	S. 67 E.	2.41
October "	S. 27 W.	0.87
November "	S. 11 E.	0.81
December "	S. 21 E.	0.53
January 1850	S. 37 E.	0.38
February "	S. 13 W.	1.11
March "	S. 4 W.	0.74
April "	S. 35 W.	0.55
May "	S. 45 W.	1.58
June "	S. 24 W.	1.20
July "	S. 86 W.	0.48

† Mean force by Beaufort's scale.

TABLE VIII.

SUMMARY OF THE WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0-12), in WOLSTENHOLM SOUND.

Month.	No. of Observations.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
August 1849.	186	5	1.6	5	2.0	8	2.0	12	2.3	32	2.7	32	3.5	34	3.6	15	3.7
September	180	6	1.8	9	2.0	11	3.4	22	4.2	17	4.5	26	5.5	26	6.3	12	6.4
October	186	3	3.0	5	1.6	7	1.1	5	1.4	7	1.1	9	1.4	14	1.4	7	2.6
November	180	3	2.0	2	1.0	1	1.0	9	1.1	17	1.4	3	2.0	13	1.1	1	3.0
December	186	9	1.3	5	2.0	9	1.4	5	1.2	17	1.2	16	1.2	20	1.5	6	5.0
January 1850.	186	4	1.2	4	1.5	6	1.0	7	1.7	26	1.1	8	1.2	21	1.8	11	1.8
February	168	8	1.2	2	2.5	8	1.9	7	1.1	27	1.2	7	1.4	13	2.0	3	2.3
March	186	5	1.4	2	2.0	9	1.6	8	1.0	50	1.2	14	1.1	13	1.1	1	1.0
April	180	7	2.4	5	1.8	10	1.1	5	1.2	42	1.1	4	1.0	7	2.4	—	—
May	186	2	2.0	—	—	11	1.7	4	1.5	31	1.3	1	1.0	2	1.0	1	10.0
June	180	26	1.4	3	1.7	4	1.8	8	1.4	31	1.3	1	2.0	3	4.0	4	6.5
July	186	28	1.7	1	2.0	10	1.3	5	2.2	19	1.9	2	2.0	5	2.0	1	1.0

(continued)

Months.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		No. of Calms.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
August 1849.	5	2.4	3	3.0	2	2.5	3	2.0	2	2.0	4	2.0	8	2.0	8	2.0	7	1.9	1
September	6	5.0	3	2.7	2	4.0	4	5.2	6	3.2	8	2.6	7	2.1	5	2.2	5	1.2	5
October	17	4.5	11	6.2	28	3.5	9	2.4	7	2.3	5	2.0	6	2.2	5	2.8	—	—	41
November	11	1.1	2	5.0	4	3.2	8	2.4	3	1.0	—	—	5	2.8	—	—	1	2.0	97
December	8	4.5	8	5.6	8	3.5	—	—	6	1.7	1	2.0	3	2.0	7	1.3	2	1.0	56
January 1850.	8	1.1	6	2.7	7	2.1	1	5.0	7	1.6	2	4.5	6	1.2	3	1.3	—	—	59
February	5	4.4	17	6.3	11	6.2	5	6.4	5	3.4	2	4.5	2	2.5	5	1.2	5	2.8	36
March	10	4.5	9	4.3	18	4.2	5	5.0	14	1.1	—	—	1	4.0	—	—	3	1.3	24
April	3	3.0	2	9.0	21	5.0	6	3.5	9	1.9	1	1.0	7	1.0	3	1.3	1	1.0	47
May	13	5.8	6	4.3	30	5.3	12	5.8	20	2.7	3	2.7	8	2.2	4	2.7	4	1.0	34
June	11	5.7	13	6.2	16	7.0	5	5.4	4	3.0	4	1.2	5	1.0	11	1.2	2	1.0	29
July	4	6.5	8	5.0	12	5.7	4	5.0	7	2.3	4	1.0	38	1.4	16	1.5	2	1.5	20



TABLE IX.

WEATHER NOTATIONS, in WOLSTENHOLM SOUND, 1849 August, to 1850 July.

Hour.	August 1849.								September 1849.								October 1849.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	3	6	22	2	8	8	5	9	6	7	17	3	—	1	10	6	13	10	8	—	—	—	—	—
6 "	2	8	21	2	8	8	6	6	6	8	16	3	4	1	8	5	13	9	9	1	—	—	3	4
Noon	4	6	21	1	8	7	6	4	6	9	15	2	3	4	6	6	12	10	9	3	—	—	6	—
4 p.m.	4	6	21	1	7	8	5	1	8	9	13	3	1	2	7	5	12	12	7	1	1	—	5	2
8 "	4	5	22	—	7	7	7	2	6	12	12	3	3	1	6	8	14	10	7	1	—	—	2	3
Mdnt.	2	4	25	—	11	6	6	9	4	10	16	3	2	3	7	11	15	7	9	2	—	—	4	3
Means	3.2	5.8	22.0	1.0	8.2	7.3	5.8	5.2	6.0	9.2	14.8	2.8	2.2	2.0	7.3	6.8	13.2	9.7	8.1	1.3	0.2	—	4.7	2.2
Hour.	November 1849.								December 1849.								January 1850.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	17	9	4	4	—	—	3	2	14	8	9	9	—	—	4	2	20	5	6	4	—	—	1	2
8 "	17	6	7	4	1	—	2	1	17	8	6	6	1	—	3	3	17	6	8	4	—	—	1	2
Noon	15	7	8	3	—	—	4	1	19	6	6	2	—	—	4	4	16	6	9	3	1	—	4	—
4 p.m.	17	7	6	3	—	—	3	—	18	5	8	1	1	—	2	3	18	6	7	2	—	—	2	1
8 "	19	7	4	6	—	—	2	—	14	9	8	7	—	—	1	2	20	5	6	4	—	—	2	2
Mdnt.	19	7	4	5	—	—	2	2	17	8	6	4	—	—	2	2	19	7	5	7	—	—	1	2
Means	17.2	7.3	5.5	4.2	0.2	—	2.7	1.0	16.5	7.3	7.2	4.8	0.3	—	2.7	2.7	18.3	5.9	6.8	4.0	0.2	—	1.8	1.5
Hours.	February 1850.								March 1850.								April 1850.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	12	7	9	9	1	—	5	5	17	5	9	4	—	—	3	4	15	6	9	2	1	—	7	3
8 "	14	7	7	6	—	—	4	6	15	4	12	2	—	—	5	3	16	5	9	—	1	—	7	2
Noon	13	7	8	6	—	—	2	5	15	6	10	3	1	—	4	2	16	6	8	2	1	—	5	3
4 p.m.	14	7	7	2	—	—	1	5	16	7	8	1	—	—	2	5	17	5	8	—	—	—	7	4
8 "	15	8	5	9	—	—	1	3	15	4	12	—	1	—	3	6	15	6	9	2	—	—	6	2
Mdnt.	13	9	6	12	—	—	1	3	16	5	10	3	1	—	2	5	14	9	7	2	—	—	5	3
Means	13.5	7.5	7.0	7.3	0.2	—	2.3	4.5	15.7	5.2	10.1	2.2	0.5	—	3.2	4.2	15.5	6.2	8.3	1.3	0.5	—	6.2	2.8
Hours.	May 1850.								June 1850.								July 1850.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	10	5	16	—	—	—	7	6	13	9	8	1	5	2	1	6	7	10	14	2	11	2	1	2
8 "	9	5	17	2	—	—	8	4	13	8	9	—	5	1	2	6	7	12	12	3	11	2	1	4
Noon	9	7	15	2	—	—	8	6	14	10	6	1	6	—	—	7	6	14	11	2	10	1	2	4
4 p.m.	12	7	12	—	—	—	6	6	13	11	6	1	5	—	—	7	9	14	8	1	8	2	2	5
8 "	12	9	10	1	—	—	7	3	10	11	9	—	8	1	—	6	9	12	10	—	5	3	2	5
Mdnt.	11	6	14	—	—	—	8	7	12	10	8	2	7	0	1	4	7	14	10	1	8	2	—	3
Means	10.5	6.5	14.0	0.8	—	—	7.3	5.3	12.5	9.8	7.7	0.8	6.0	0.7	0.7	6.0	7.5	12.7	10.8	1.5	8.8	2.0	1.3	3.8

## REMARKS from the Log of H.M.S. "NORTH STAR."

1849.—AUGUST.

- 1st - - Lat. 75° 5' N., long. 59° 52' W. Beset in the ice, no bottom at 340 fathoms.  
 4th - - " 75° 4', long. 59° 52'.  
 11th - - " 75° 8', " 59° 49'.  
 12th - - " 75° 13', " 60° 11'. In 172 fathoms light sand and mud.  
 15th - - In 135 fathoms, sandy mud and stones.  
 16th - - Lat. 75° 12'.  
 17th - - Temperature of sea water 28°; in 237 fathoms soft mud.  
 21st - - No bottom at 300 fathoms.  
 24th - - Lat. 75° 15', long. 60° 22'. Shot a bear.  
 26th - - In 292 fathoms, soft mud.  
 28th - - Lat. 75° 17', long. 60° 42'.  
 29th - - " 75° 23', " 61° 12', no bottom in 295 fathoms..

## SEPTEMBER.

- 1st - - No bottom at 300 fathoms.  
 5th - - Lat. 75° 37', long. 62° 24'. At 6 p.m. a large halo round the sun.  
 8th - - No bottom at 300 fathoms. Cape York N. 4° E., Cape Melville N. 86° E.  
 10th - - Lat. 75° 43', long. 63° 26'.  
 11th - - " 75° 44', " 64° 5'. In 373 fathoms soft mud.  
 13th - - Several narwhals seen.  
 14th - - Lat. 75° 43', long. 64° 49'. In 350 fathoms soft mud.  
 15th - - " 75° 42', " 64° 57'. In 325 fathoms soft mud.  
 16th - - " 75° 42', " 65° 2'.  
 17th - - " 75° 38', " 65° 15'. In 275 fathoms soft mud.  
 19th - - " 75° 36', " 66° 47'. In 258 fathoms soft mud.  
 21st - - Sounded in 223 fathoms, sand and small stones; again in 210 fathoms, soft mud.  
 22nd - - Lat. 75° 38', long. 68° 12'. A large iceberg.  
 23rd - - " 75° 45'. Young ice forming all round.  
 24th - - Sounded in 150 fathoms; grey sand and black stones.  
 25th - - " 129 fathoms; mud and black stones.  
 26th - - " 185 fathoms. At 6 p.m. running into Wolstenholm Sound. At 7 p.m. sounded in 65 fathoms, grey sand. At 9.30 p.m. anchored in 19 fathoms.  
 27th - - At 9 a.m. made sail. Noon, Cape Athol S. 8° W.; Dalrymple rock, S. 34° W.; Cape White, S. 60° W., by compass.  
 28th - - Working up Wolstenholm Sound.  
 30th - - Warping into winter quarters. Bay ice forming.

## OCTOBER.

- 3rd - - Variation 92° W.  
 4th - - A Wly. swell setting into the Sound at 8 p.m.  
 5th - - Ice breaking up. 8 a.m., bay clear of ice. 8 p.m., ice in motion in bay.  
 6th - - Ice broken up and floating out, afterwards in.  
 7th - - Bay full of ice.  
 8th - - Ice breaking up and floating out.  
 9th - - Bay clear of ice.  
 10th, 4 p.m. - Bay entirely frozen over. At 11 p.m. aurora very bright, extending from E. to W.  
 14th, 8 p.m. - Aurora from E. to W.



## NOVEMBER.

- 14th - - Aurora S. by E., extending perpendicular faintly for 15 minutes.  
 22nd - - Aurora very brilliant, bearing W.S.W.

## DECEMBER.

- 13th - - Aurora brilliant from E. to W. at 8 a.m.  
 16th - - Quicksilver froze on the ice quite solid at  $-47^{\circ}$ .

## 1850.—JANUARY.

- 2nd - - Thickness of ice 3 feet.  
 4th - - Temperature of the sea at the bottom,  $29^{\circ}$ ; at surface,  $28^{\circ}$ ; on the ice,  $-38^{\circ}$ .  
 9th, 8 p.m. - Aurora E. and W.  
 14th, 10 p.m. - Aurora E. to W.  
 19th, 6 a.m. - A bright column of aurora opened out extending from S. to Nwd.

## FEBRUARY.

- 2nd, 9 p.m. - Aurora very brilliant for 20 minutes.  
 7th, 10 p.m. - Faint aurora, W.  
 15th - - Saw the sun from the hills.

## MARCH.

- 1st - - Quicksilver on board froze quite solid, thermometer  $-42^{\circ}$ .  
 6th, Midnight - Aurora brilliant E. and W.  
 22nd, Noon - Temperature in shade,  $-26^{\circ}$ ; in sunshine,  $26^{\circ}$ .  
 23rd, Noon - " "  $-21$ ; "  $28^{\circ}$ , on a black surface.  
 24th, Noon - " "  $-28$ ; "  $26^{\circ}$ , "  
 25th, Noon - " "  $-11$ ; "  $23^{\circ}$ .  
 29th, Noon - " "  $-20$ ; "  $32^{\circ}$ .  
 31st, Noon - " "  $+1$ ; "  $10^{\circ}$ , outside the ship.

## MAY.

- 15th - - Ice very much cracked, salt water on the floe.

## JULY.

- 1st - - Thirty-one seals in sight on the ice.  
 18th - - Ice from 3 feet 10 inches to 4 feet in thickness.  
 20th - - Counted 110 seals on the ice. Ice varying from 3 feet 10 inches to 2 feet 8 inches in thickness.  
 22nd - - A number of floes floating about.  
 24th - - Bay ice formed round the ship.  
 25th, 11 p.m. - The floe parted round the ship.  
 26th - - A number of white whales in the bay.  
 30th - - Ice in motion and the water well open.  
 The "North Star" left Wolstenholm Sound on August 3rd.

## No. XXI.

## Results of Meteorological Observations made at Fort Simpson.

In the summers of 1849 and 1850 Lieutenant (now Vice-Admiral) W. J. S. Pullen conducted boat expeditions in search of Sir John Franklin. The winters were passed at Fort Simpson, where a meteorological register was kept, which has been deposited in the Meteorological Office.

The observations are now reduced and discussed for the first time.

Fort Simpson is on the river Mackenzie, in latitude  $62^{\circ} 7' N.$ , longitude  $121^{\circ} 33' W.$

An aneroid was used for observing the atmospheric pressure, and its errors in comparison with a mercurial barometer are unknown.

The party was supplied with a number of thermometers, as appears from the following note, signed W. J. S. Pullen:—"For the meteorological observations at Fort Simpson, I had no less than twenty-two thermometers in the open air. Three of these thermometers were Negretti's, one of which was mercury, the others were Adie's, all spirit, eighteen on a flat scale, five on a round, all numbered so that they may be referred to in the register.

"The differences between Adie's thermometers were small in most cases, and at high temperatures they and Negretti's nearly agreed. At the low temperatures Negretti's always showed a severer degree of cold, particularly on the 22nd January 1851, when the lowest by Adie's, taking the mean of eighteen, was  $-48^{\circ} 08$ , whereas the mean of the two spirit ones of Negretti's was  $-67^{\circ} 8$ , they differing  $4^{\circ} 2$ .

"The freezing-point of mercury is, I believe,  $-40^{\circ}$ , but by Adie's thermometers, both in 1849 and 1850, the mercury which I tried froze hard at  $-37^{\circ}$ , by which I consider they are  $3^{\circ}$  in error, making the lowest temperature at Fort Simpson  $-51^{\circ}$ . Curious, too, both in 1850 and 1851, it was on the 22nd January between 8 and 9 in the morning."

As the spirit thermometer Adie No. 13 was used for the register kept in 1849-50, the readings from the same instrument only have been taken from the register for 1850-51.

On December 20th, 1849, it was remarked, "Quicksilver froze hard with the thermometer standing between  $36^{\circ}$  and  $37^{\circ}$  below zero."

The following probable corrections have been applied to the readings: at  $32^{\circ}, 0^{\circ}$ ; at  $-38^{\circ}, -1^{\circ} 4$ .

The observations on the temperature of the river, which are given in the remarks, were taken by thermometer No. 6, spirit, by Adie, which agreed very well with No. 13 above  $32^{\circ}$ .



The direction of the wind and all bearings were observed in reference to the true meridian.

The weather was recorded by the Beaufort notation. During the first winter the clouds were not observed with the regularity requisite for a statistic summary, but more attention was given to them during the second. On May 31st, 1851, at 3 p.m., the weather was noted as b. c. l. t., which is the only entry of lightning and thunder.

The aurora was very carefully watched, and numerous pencil drawings of its forms were made by Lieutenant Hooper, some of which are bound up with the register No. 2074.

Owing to want of observations for the night hours, monthly averages have not been worked out; as these can be correctly deduced only when the diurnal ranges of the atmospheric phenomena are satisfactorily known, which is one of the ultimate objects of this work. Meanwhile, whoever requires any simple monthly means can readily deduce them from the data contained in the Tables I. to V.

Table I. contains the means of the aneroid readings, the mean temperatures, the sums of the wind components, and the sums of the weather notations at each observing hour of the day for each month. January is the coldest month, its mean temperature being about  $-24^{\circ}$ . The mean temperature of May is about  $50^{\circ}$ .

Table II. supplies results of observations made on the clouds. From December to April inclusive cloudless sky was frequently noted. The most common form of cloud was nimbus in October and November; nimbus and stratus in December; stratus in January; nimbus and cumulus in February, March, and April; nimbus and cirrus in May. Probably there was an undue estimation of nimbus.

Table III. shows the extreme readings of the aneroid, with accompanying temperature, wind, and weather, observed in each month. The highest reading of the aneroid during the two periods was 28.86 inches, the lowest 26.87, so that the extreme range was about two inches. The high pressures were generally accompanied with colder weather than the low pressures.

Table IV. exhibits the extremes of temperature, with accompanying pressure, wind, and weather, observed in each month. The highest temperature during the two periods was  $83^{\circ}$ , the lowest  $-50^{\circ}$ , so that the extreme range was  $133^{\circ}$ .

Table V.—In this table summaries are given, for months, of the wind observations referred to sixteen points of the compass, with the mean force (scale 0 to 12). Calms vary in frequency from 35 per cent. in December to 24 per cent. in October. The strongest winds blow from N.N.W. Winds from N.W., W.N.W., or W. are the most frequent, and the next most favoured direction is from S.E. to E.S.E. December to March appears to be the season most subject to N.Wly. winds, April to October that to S.Ely. winds.

Wind of force 8 and upward was recorded in 1849 December, twice; in 1850 May, five times; in June, three times; in October, once; in November, four times; in December, once. In 1851, February, twice; in March, twice; and in April, once. These figures show that gales and squalls are by no means of frequent occurrence.

TABLE I.  
RESULTS OF METEOROLOGICAL OBSERVATIONS made at FORT SIMPSON.

Month.	Hour.	Barometer, Aneroid.	Thermo- meter.	Sums of Wind Components.				Weather Notations.							
				N.	S.	E.	W.	b.	c.	o.	m.	f.	r.	s.	q.
1849.		inches.	°												
October 12th to 31st -	9 a.m. -	27.748	23.8	21.5	9.7	17.9	20.3	4	4	12	3	—	—	3	1
"	Noon -	.729	28.4	13.8	8.8	14.3	20.4	5	4	11	1	—	—	2	1
"	3 p.m. -	.723	28.2	14.5	7.7	13.2	17.4	5	5	10	—	—	—	2	—
"	6 " -	.729	25.0	13.4	3.9	7.4	13.4	5	7	8	—	—	1	2	—
"	9 " -	.724	23.3	18.6	4.2	10.2	19.8	6	4	10	—	—	1	4	—
November	8 a.m. -	—	—	8.1	8.8	8.8	19.1	5	8	17	3	3	—	6	—
"	10 " -	27.670	7.0	6.5	8.5	9.6	17.2	7	7	16	2	3	—	6	—
"	Noon -	.665	8.8	4.8	8.2	11.4	17.1	8	7	15	3	3	—	6	—
"	2 p.m. -	.662	9.1	8.6	5.6	9.1	19.0	7	8	15	1	3	—	4	—
"	4 " -	.675	7.8	5.1	9.5	11.9	20.2	7	9	14	1	2	—	3	—
"	6 " -	.661	7.1	4.5	8.8	10.2	12.6	10	7	13	1	2	—	4	—
"	8 " -	.660	6.8	6.9	10.1	11.4	9.4	7	8	15	—	2	—	4	—
December	8 a.m. -	—	—	26.9	8.0	7.5	24.7	15	8	8	—	—	—	3	—
"	10 " -	28.117	-15.4	26.5	6.7	6.3	24.2	15	10	6	—	—	—	3	—
"	Noon -	.131	-13.1	25.0	8.8	9.7	26.1	17	8	6	—	—	—	4	—
"	2 p.m. -	.128	-12.9	20.7	8.6	10.4	28.8	16	8	7	1	—	—	4	1
"	4 " -	.148	-13.7	13.6	8.2	7.4	33.9	14	10	7	1	—	—	2	1
"	6 " -	.158	-14.1	12.9	9.5	7.2	36.1	17	5	9	—	—	—	4	1
"	8 " -	.164	-15.4	15.1	5.3	9.2	36.2	21	4	6	1	—	—	2	1
"	10 " -	.172	-15.7	10.6	4.5	9.7	29.8	22	3	6	—	—	—	2	1
1850.															
January	8 a.m. -	—	—	16.4	3.9	3.9	25.2	12	11	8	3	—	—	4	—
"	10 " -	28.031	-30.5	17.2	4.3	4.8	25.9	12	11	8	3	—	—	6	—
"	Noon -	.037	-27.0	22.8	3.3	4.5	29.7	12	12	7	4	—	—	5	—
"	2 p.m. -	.050	-26.0	25.4	2.9	4.6	33.1	10	12	9	4	—	—	5	—
"	4 " -	.058	-27.3	21.1	3.4	3.7	28.5	11	12	8	4	—	—	3	—
"	6 " -	.075	-28.0	21.2	3.1	4.5	28.3	13	11	7	3	—	—	4	—
"	8 " -	.083	-28.2	12.4	8.3	6.7	33.6	13	9	9	4	—	—	8	—
"	10 " -	.082	-29.2	11.8	8.0	4.3	32.8	14	8	9	5	—	—	6	—
February	8 a.m. -	—	—	16.2	12.4	24.9	28.0	9	11	8	3	—	—	3	1
"	10 " -	27.728	-5.0	18.8	14.3	22.5	28.7	10	11	7	3	—	—	3	1
"	Noon -	.732	-0.3	19.1	11.1	20.9	32.3	11	11	6	3	—	—	4	1
"	2 " -	.712	+1.4	22.4	8.6	22.4	28.6	10	13	5	1	—	—	2	1
"	4 " -	.715	+0.6	16.7	9.7	21.8	23.9	9	12	7	3	—	—	2	—
"	6 " -	.722	-1.4	12.1	10.8	21.0	18.2	10	9	9	2	—	—	3	—
"	8 " -	.730	-2.6	11.4	11.6	16.0	16.5	12	7	9	—	—	—	4	—
"	10 " -	.723	-4.5	9.4	13.7	17.1	18.0	12	8	8	4	—	—	3	—



TABLE I. (continued).

RESULTS OF METEOROLOGICAL OBSERVATIONS made at FORT SIMPSON—continued.

Month.	Hour.	Barometer, Aneroid.	Thermo- meter.	Sums of Wind Components.				Weather Notations.							
				N.	S.	E.	W.	b.	c.	o.	m.	f.	r.	s.	q.
1850.															
March	8 a.m.	28.105	-7.0	26.7	4.8	14.2	29.7	10	10	11	7	—	—	5	1
"	10 "	.107	-0.7	26.8	3.2	16.8	31.9	10	13	8	9	—	—	3	1
"	Noon	.101	+4.3	26.2	1.9	16.5	29.6	11	14	6	5	—	—	3	3
"	2 p.m.	.090	+6.7	35.0	5.8	16.5	25.4	11	15	5	2	—	—	3	2
"	4 "	.084	+6.1	27.3	6.6	15.0	24.7	11	12	8	3	—	—	5	2
"	6 "	.086	+2.3	18.6	5.7	7.4	17.8	9	14	8	3	—	—	3	—
"	8 "	.099	-0.4	17.6	9.1	8.3	14.2	11	12	8	3	—	—	6	—
"	10 "	.109	-3.0	18.6	9.1	8.6	15.9	11	11	9	5	—	—	7	—
April	8 a.m.	—	22.0	11.3	13.3	26.6	18.3	13	14	3	1	—	1	1	1
"	10 "	28.041	28.9	15.6	16.0	29.4	17.7	14	13	3	1	—	—	2	1
"	Noon	.026	32.2	15.9	13.5	30.4	14.2	14	12	4	2	—	—	1	2
"	2 p.m.	.022	34.4	17.7	14.3	30.5	12.1	14	14	2	2	—	—	1	2
"	4 "	.022	33.5	14.6	13.0	24.6	10.1	13	15	2	1	—	—	2	1
"	6 "	.030	31.2	13.8	10.1	23.8	9.0	13	15	2	—	—	—	1	—
"	8 "	.028	26.3	12.4	8.1	25.6	7.3	14	14	2	—	—	—	—	—
"	10 "	.058	22.5	12.3	8.5	26.9	7.9	13	16	1	1	—	—	1	2
May	8 a.m.	27.971	48.3	20.9	7.9	7.9	17.7	14	15	2	1	—	—	1	1
"	10 "	.960	51.6	26.3	11.1	7.9	25.4	13	14	4	1	—	—	1	2
"	Noon	.938	54.2	27.0	18.1	9.7	29.0	15	12	4	—	—	1	2	3
"	2 p.m.	.926	55.2	35.5	20.7	8.4	12.5	13	16	2	—	—	—	—	3
"	4 "	.925	54.9	32.9	17.4	10.5	9.3	13	16	2	—	—	—	—	1
"	6 "	.913	52.8	34.0	15.6	16.0	9.9	13	18	—	—	—	—	—	2
"	8 "	.931	47.6	30.7	12.5	16.8	13.5	13	17	1	—	—	—	1	2
"	10 "	.951	41.7	26.9	11.1	15.8	11.7	15	17	1	—	—	—	1	3
June 1st to 18th	8 "	27.755*	60.9*	18.5	1.7	4.8	16.6	10	7	1	—	—	1	—	2
"	10 "	.747	64.2	19.6	2.7	5.8	20.4	10	7	1	—	—	1	—	2
"	Noon	.733	65.9	22.9	5.9	6.7	17.9	8	8	2	—	—	2	—	2
"	2 p.m.	.728	65.8	18.9	17.3	14.2	20.1	7	9	2	—	—	2	—	2
"	4 "	.718	66.5	16.8	15.6	12.3	15.3	8	9	1	—	—	1	—	2
"	6 "	.714	65.1	15.4	11.1	9.5	13.5	8	8	2	—	—	—	1	3
"	8 "	.723	59.7	15.7	7.8	3.9	13.1	8	9	1	—	—	—	—	2
"	10 "	.737	55.1	14.9	8.3	7.6	13.1	8	9	1	—	—	—	—	2
October 14th to 31st	9 a.m.	27.632	25.1	9.4	16.6	15.9	16.0	4	4	10	1	1	—	6	1
"	Noon	.637	29.1	9.1	16.1	16.9	21.1	4	4	10	1	—	—	4	1
"	3 p.m.	.641	28.5	7.0	16.0	13.6	13.9	4	5	9	—	—	2	4	1
"	6 "	.637	25.9	8.8	11.6	12.9	23.3	2	2	14	1	—	—	4	1
"	9 "	.637	25.6	15.8	15.8	24.4	27.8	3	3	12	1	—	—	4	—

\* For 1st to 12th inclusive only.

TABLE I. (concluded).

RESULTS OF METEOROLOGICAL OBSERVATIONS made at FORT SIMPSON—continued.

Month.	Hour.	Barometer, Aneroid.	Thermo- meter.	Sums of Wind Components.				Weather Notations.							
				N.	S.	E.	W.	b.	c.	o.	m.	f.	r.	s.	q.
1850.															
November	9 a.m.	27.540	12.3	36.5	28.9	38.4	35.9	9	9	12	—	1	—	7	1
"	Noon	.560	15.4	36.1	25.2	28.7	38.4	9	8	13	—	1	—	5	2
"	3 p.m.	.565	15.0	23.5	28.7	29.1	25.0	10	8	12	—	—	—	3	1
"	6 "	.581	12.6	12.5	21.8	28.6	42.7	12	6	12	—	—	—	4	1
"	9 "	.585	12.3	12.9	23.9	23.1	40.5	11	6	13	1	—	—	6	1
December	9 a.m.	27.888	-9.4	7.6	18.7	14.8	12.1	16	8	7	—	—	—	4	—
"	Noon	.900	-6.6	9.6	14.3	14.4	11.5	16	10	5	—	—	—	6	—
"	3 p.m.	.909	-7.5	6.3	11.1	15.9	18.9	15	9	7	—	—	—	4	—
"	6 "	.915	-7.8	6.8	9.7	21.8	29.7	13	8	10	—	—	—	4	2
"	9 "	.910	-7.6	7.1	14.2	22.4	24.5	14	8	9	—	—	—	3	2
1851.															
January	9 a.m.	27.862	-23.1	20.7	10.1	16.0	38.4	14	10	7	3	—	—	2	1
"	Noon	.894	-19.2	19.8	8.0	18.8	33.3	15	8	8	2	—	—	3	1
"	3 p.m.	.895	-18.6	16.9	8.3	9.6	30.4	15	10	6	1	—	—	4	1
"	6 "	.917	-20.8	16.1	3.0	9.5	40.1	16	8	7	2	—	—	1	—
"	9 "	.920	-21.2	13.0	7.8	7.8	44.2	16	8	7	2	—	—	4	—
February	9 a.m.	27.949	-13.7	23.8	8.8	14.9	26.4	10	9	9	4	—	—	5	—
"	Noon	.955	-6.3	29.5	8.6	12.4	19.9	11	9	8	6	—	—	7	—
"	3 p.m.	.945	-4.5	24.5	14.4	13.3	23.1	10	10	8	7	—	—	6	—
"	6 "	.949	-8.0	19.3	12.7	19.8	24.8	10	8	10	3	—	—	3	—
"	9 "	.949	-9.9	21.8	5.5	23.9	25.8	10	8	10	3	—	—	5	—
March	9 a.m.	27.792	4.9	28.0	7.4	14.8	23.9	11	14	6	6	—	—	6	—
"	Noon	.789	14.4	36.1	7.8	12.9	32.0	14	13	4	3	—	—	5	1
"	3 p.m.	.785	15.6	33.9	13.1	18.3	28.2	13	11	7	2	—	—	4	1
"	6 "	.775	11.2	35.1	11.8	20.4	17.4	15	10	6	2	—	—	4	1
"	9 "	.789	6.7	31.2	9.5	24.9	31.0	14	9	8	3	—	—	2	1
April	9 a.m.	28.038	29.4	30.1	9.0	8.9	31.1	14	10	6	1	—	—	4	2
"	Noon	.018	33.8	38.2	11.1	25.6	24.0	15	11	4	1	—	—	4	3
"	3 p.m.	.000	35.2	39.1	8.1	27.5	23.0	18	10	2	—	—	—	1	5
"	6 "	27.998	33.2	29.7	8.4	25.5	14.2	17	10	3	—	—	—	3	4
"	9 "	28.009	25.9	13.7	8.3	22.3	15.8	15	12	3	1	—	—	2	—
May	9 a.m.	27.886	46.8	35.6	6.8	20.9	46.5	13	12	6	—	—	1	2	2
"	Noon	.870	49.8	41.1	13.5	24.0	43.8	14	12	5	1	—	—	2	1
"	3 p.m.	.849	50.8	37.4	15.3	30.5	38.3	12	12	7	—	—	—	4	2
"	6 "	.836	47.3	35.3	5.9	31.0	22.5	11	13	7	1	—	—	4	1
"	9 "	.856	41.5	21.8	6.0	25.1	27.2	10	10	11	2	—	—	5	1



TABLE II.

RESULTS OF OBSERVATIONS ON THE CLOUDS, at FORT SIMPSON.

Month.	Hour.	Amount.	Cir.	Cir.-c.	Cir.-s.	Cum.	Cum.-s.	Str.	Nim.	Nil.
1850.										
October, 14th to 31st-	9 a.m. -	7.8	1	—	1	4	—	2	10	—
" "	Noon -	7.8	1	—	3	3	—	—	10	1
" "	3 p.m. -	7.8	—	1	—	1	2	1	12	1
" "	6 " -	8.2	—	—	—	2	—	1	14	1
" "	9 " -	8.5	1	—	—	3	—	—	13	1
November -	9 a.m. -	6.6	4	1	2	4	1	3	13	2
" -	Noon -	6.5	1	2	6	2	2	1	13	3
" -	3 p.m. -	6.8	2	—	3	3	4	3	13	2
" -	6 " -	6.1	—	1	—	3	—	5	15	6
" -	9 " -	6.2	—	1	—	2	1	2	17	7
December -	9 a.m. -	4.5	3	—	3	4	4	3	5	9
" -	Noon -	5.1	2	2	2	2	3	7	7	6
" -	3 p.m. -	4.9	1	—	4	3	3	6	7	7
" -	6 " -	4.5	2	1	—	2	—	2	16	8
" -	9 " -	4.4	1	—	2	4	—	2	14	8
1851.										
January -	9 a.m. -	4.6	1	1	4	1	3	14	1	6
" -	Noon -	4.6	1	2	4	1	4	10	1	8
" -	3 p.m. -	4.7	1	1	5	5	3	9	1	6
" -	6 " -	3.3	2	2	—	3	1	8	3	12
" -	9 " -	2.7	3	1	—	2	—	6	7	12
February -	9 a.m. -	7.0	1	3	2	3	4	4	8	3
" -	Noon -	6.2	1	5	1	3	2	3	8	5
" -	3 p.m. -	6.4	1	1	2	5	2	4	9	4
" -	6 " -	5.8	1	—	2	10	—	1	9	5
" -	9 " -	5.6	1	1	—	8	1	—	11	6
March -	9 a.m. -	5.9	3	3	1	6	2	2	10	4
" -	Noon -	5.0	3	5	3	5	1	1	8	5
" -	3 p.m. -	5.3	2	3	4	8	—	—	9	5
" -	6 " -	5.0	3	1	4	6	2	1	8	6
" -	9 " -	4.7	3	—	1	5	3	2	9	8
April -	9 a.m. -	4.7	3	1	3	7	1	2	7	6
" -	Noon -	4.2	4	2	2	7	1	2	6	6
" -	3 p.m. -	4.1	6	1	—	8	—	1	6	8
" -	6 " -	4.5	3	1	2	6	1	2	7	8
" -	9 " -	3.5	3	4	3	3	1	4	5	7
May -	9 a.m. -	5.6	9	6	—	1	1	2	9	3
" -	Noon -	5.3	9	6	1	3	—	2	6	4
" -	3 p.m. -	6.0	7	5	2	4	—	—	9	4
" -	6 " -	6.1	6	2	5	1	—	1	13	3
" -	9 " -	6.6	10	—	3	1	1	1	14	1

TABLE III.

EXTREME READINGS OF ANEROID, with accompanying TEMPERATURE, WIND, and WEATHER, at FORT SIMPSON.

Month.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Weather.	Range.
1849.											
October, 12th to 31st	d. h.	inches.				d. h.	inches.				inch.
November -	17 0	28.17	+36.4	N.W. 2	b c	26 6	27.07	+22.8	Calm	o	1.10
December -	26 4	.55	+7.0	E.S.E. 3	"	11 8	26.87	26.0	E.S.E. 4	c o	1.68
1850.											
January -	9 22	.86	-16.5	Calm	"	24 8	27.11	+2.4	W. 7	s	1.75
February -	21 8	.53	33.8	W.N.W. 1	b	7 22	.34	-27.7	Calm	b c	1.19
March -	1 6	.83	34.1	Calm	b c	17 4	.10	+13.1	E. 1	"	1.73
April -	21 8	.71	-8.1	"	b	3 4	.13	16.2	Calm	"	1.58
May -	15 22	.63	+22.0	S.E. 1	b c	22 2	.08	55.3	S.S.W. 4	"	1.55
June, 1st to 12th	23 10	.30	25.3	N. 3	"	31 4	.40	61.6	Calm	"	0.90
October, 14th to 31st	6 20	27.95	58.8	Calm	b	0 20	.48	+47.0	"	o r	0.47
November -	23 0	28.08	+21.5	S.E. 2	b v	29 3	26.96	39.0	S.S.W. 4	"	1.12
December -	30 9	.46	-15.4	N.W. 6	b e q	8 9	.87	31.0	S.E. 1	o e g	1.59
1851.											
January -	2 9	.67	35.3	Calm	b v	19 6	27.22	+1.7	N. 1	o	1.45
February -	26 3	.54	16.6	W. 1	b e v	9 0	.10	-50.2	S.E. 1	b e	1.44
March -	5 9	.34	-29.0	Calm	b c	15 0	.62	+4.7	Calm	"	0.72
April -	1 3	.43	+3.8	S.W. 1	"	12 12	26.97	27.8	S.E.b.E. 2	b c w	1.46
May -	25 21	.63	30.9	S.S.E. 1	b v	12 21	27.51	34.8	Calm	b e v	1.12
	13 21	.45	+37.6	E. 3	b c	4 6	.18	+48.8	W. 3	b c	1.27

TABLE IV.

EXTREMES OF TEMPERATURE, with accompanying PRESSURE, WIND, and WEATHER, at FORT SIMPSON.

Month.	Date.	Max.	Aneroid.	Wind.	Weather.	Date.	Min.	Aneroid.	Wind.	Weather.	Range.
1849.											
October, 12th to 31st	d. h.		inches.			d. h.		inches.			
November -	19 0	+47.0	27.39	S. b. E. 2	b	31 9	+2.4	27.83	S.E. 2	b c	44.6
December -	11 8	26.0	26.87	E.S.E. 4	c o	16 20	-13.9	.80	Calm	o f	39.9
1850.											
January -	4 6	16.8	27.75	W.N.W. 4	o	29 10	47.0	28.55	"	b	63.8
February -	3 2	23.3	28.23	N.W. 3	b c	21 20	50.0	.25	S.S.E. 2	b m	73.3
March -	11 4	35.0	27.44	S. 1	o	1 10	37.4	.80	Calm	b	72.4
April -	29 4	35.6	.72	S.E. 1	"	5 20	31.2	.62	E.S.E. 1	"	66.8
May -	30 0	53.2	.59	Calm	c	3 20	-2.7	.29	Calm	b c	55.9
June, 1st to 12th	11 2	75.0	.54	S. 5	b c	22 10	+17.7	.28	N.W. 7	c q s	57.3
October, 14th to 31st	12 0	83.0	.68	S.W. 2	"	3 10	42.5	27.82	Calm	b	40.5
November -	27 9	37.3	.63	W. 6	b e v	20 21	+14.5	27.62	"	f	22.8
December -	5 3	33.7	.20	E. 3	b c	30 9	-15.4	28.46	N.W. 6	b e q	49.1
1851.											
January -	29 9	46.6	.46	S. 6	b e q w	2 9	35.3	.67	Calm	b v	81.9
February -	9 0	1.5	.10	S.E. 1	b c	21 21	50.2	27.96	"	b w	51.7
March -	13 3	20.5	28.02	N.N.W. 6	o c	22 21	36.7	.98	"	b v	57.2
April -	12 3	37.7	27.17	S.S.E. 2	b e v	2 9	12.0	28.33	W.N.W. 3	"	49.7
May -	18 3	57.8	.74	E.S.E. 2	b c	8 9	-11.0	.33	W. 1	"	68.8
	31 0	+72.0	28.05	W. b. N. 1	"	5 6	+23.8	27.53	" 5	o e s	48.2



TABLE V.

SUMMARY OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), at FORT SIMPSON.

Years 1849-50-1.				Total Observations.		N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
						O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
January	-	-	-	-	403	5	2.6	1	1.0	1	1.0	2	1.0	15	1.9	18	1.9	25	1.7	7	2.0
February	-	-	-	-	364	10	3.7	1	1.0	1	5.0	-	-	29	2.8	36	2.8	38	2.3	11	2.3
March	-	-	-	-	403	13	4.6	3	2.7	-	-	2	2.0	29	2.4	33	2.5	27	1.9	7	2.1
April	-	-	-	-	390	16	3.3	11	3.0	8	1.1	1	2.0	50	2.0	57	2.8	31	2.0	5	2.4
May	-	-	-	-	403	37	2.9	16	2.6	5	1.8	-	-	25	3.2	38	2.1	41	1.6	4	1.5
June	-	-	-	-	144	14	4.4	-	-	-	-	-	-	8	3.4	16	2.6	-	-	-	-
October	-	-	-	-	190	9	3.2	-	-	1	7.0	2	2.0	11	2.6	15	3.1	29	3.0	6	2.3
November	-	-	-	-	360	10	4.6	-	-	2	4.0	7	1.1	12	2.3	29	2.6	52	2.9	12	2.2
December	-	-	-	-	403	4	2.5	-	-	-	-	2	2.0	23	2.4	25	2.1	31	2.0	11	1.3

(continued.)

Years 1849-50-1.				S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		No. of Calms.
				O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
January	-	-	-	5	1.6	3	1.7	3	1.7	3	1.0	51	2.5	66	2.3	76	2.6	8	3.1	-	-	114
February	-	-	-	5	1.4	1	1.0	5	2.8	4	2.0	18	2.7	41	4.2	43	3.2	17	3.4	2	2.0	102
March	-	-	-	4	1.5	1	1.0	3	2.7	2	3.0	17	2.1	37	2.8	58	3.0	30	4.6	3	1.0	134
April	-	-	-	5	1.6	3	4.0	-	-	2	3.0	18	1.9	15	3.1	37	3.2	17	4.4	4	1.0	110
May	-	-	-	11	3.2	8	3.1	5	3.0	6	4.3	19	4.0	11	2.8	33	4.3	33	4.5	2	1.0	109
June	-	-	-	14	2.5	6	2.3	6	2.0	1	2.0	11	4.4	-	-	23	3.5	3	8.7	1	1.0	41
October	-	-	-	3	1.3	3	2.7	2	4.5	2	4.0	19	4.2	15	3.4	19	2.8	8	5.2	-	-	46
November	-	-	-	18	1.2	2	2.0	5	1.2	3	1.3	40	3.1	25	4.0	16	4.3	8	3.6	1	2.0	118
December	-	-	-	14	2.0	4	2.7	4	2.2	10	1.9	50	2.3	26	2.9	41	3.4	16	2.8	-	-	142

REMARKS AT FORT SIMPSON.

1849.—OCTOBER.

- 13th, 9 p.m. - The aurora in bright arches, pale yellow, E. by S. to W. by N.
- 14th, 6 p.m. - A streak of the aurora from E. by S. to W. by N. in the zenith, and of prismatic colours. At 9 p.m. it had disappeared.
- 18th, 9 p.m. - Bright arches of the aurora from N.N.E. to S.S.W., passing through the zenith, affecting the declinometer but slightly.
- 21st, 9 p.m. - Aurora in a broad arch from S.E. to N.W., pale straw colour.
- 23rd, 6 a.m. - Snow during the night, about 3 inches fallen.
- 29th, 9 a.m. - The passage in stream very small from the accumulation of driving ice.
- 30th, 6 a.m. - About 2 inches of snow fallen during the night.
- 30th, 6 p.m. - About 12 inches snow fallen during the day.
- 31st, 6 a.m. - Nearly 2 feet of snow fallen.

NOVEMBER.

- 7th, 4 a.m. - River not yet fast, but all navigation stopped.
- 7th, 8 p.m. - About 1 inch of snow fallen.
- 12th, 4 a.m. - Heavy gale last night, snow driving very much.
- 12th, 8 p.m. - A single streak of aurora of a pale yellow colour to the E.
- 13th, 10 p.m. - Several faint streaks of aurora.
- 14th, 6 p.m. - A pale arch of aurora from the Ed., through the heavens to the N., obscuring the pole star, and terminating about 10° above the horizon, faint in the centre of arch.
- 21st, 8 p.m. - From 2 to 3 inches of snow has fallen to-day.
- 26th, 4 a.m. - River rising and ice driving slowly, an indication of soon closing up altogether.
- 27th, 4 a.m. - River is now closed, forming a very uneven surface.
- 27th, 10 a.m. - Parhelia on either side of sun, subtending an angle of 44°.
- 28th, 8 p.m. - Bright streaks of aurora coruscating in the zenith.

DECEMBER.

- 3rd, 8 p.m. - A faint arch of aurora extending from E.N.E. to W.S.W. by N., the altitude of the centre about 10°.
- 6th, 6 a.m. - Snow during the night, about 2 inches fallen.
- 7th, 6 p.m. - A few faint streaks of aurora to the Nd.
- 7th, 7 p.m. - Several pale streaks of aurora to the N.E., extending from S.E. to N.W. in parallel curves up to the zenith. The first and broadest commencing under Mars from the horizon, passing just under the Twins, cutting the tail of the Great Bear and dropping to the horizon. At 7.30 the aurora appeared, and the declinometer from 16 increased to 30, coming gradually back as the aurora diminished, for at 10 there was only a single pale arch in the northern heavens, very low.
- 10th, 10 p.m. - A pale arch of aurora E.S.E. to W.N.W., passing through the zenith.
- 11th, 11 p.m. - A narrow but double arch of aurora E. by S. and W. by N., passing directly through the zenith, commencing about 10° above the horizon to the Ed. very broad.
- 18th, 8 p.m. - A single but irregular arch of aurora passing through the zenith.
- 19th, 8 p.m. - Faint patches of aurora from N.E. to W., low in the heavens.
- 20th, 8 a.m. - Quicksilver frozen hard with the thermometer standing between 36° and 37° below zero.
- 25th, 4 a.m. - More snow fallen last night than at any other time for the season. The wind about 4 this morning blowing heavily from N.W. by W.
- 31st, 6 p.m. - A broken arch of pale aurora to the N.E.



## 1850.—JANUARY.

- 3rd, 8 p.m. - Several patches of aurora in the zenith.  
 3rd, 10 p.m. - Faint streaks of aurora to the N.W., and in the zenith.  
 13th, 10 p.m. - A faint streak of aurora in the zenith.  
 18th, 6 p.m. - A faint streak of aurora in the sky to the S.E., reaching almost to the zenith, affecting the declinometer.  
 18th, 10 a.m. - Several streaks of aurora in the sky, chiefly in the zenith.  
 19th, 9 p.m. - Very light snow, with several streaks of aurora in the zenith.  
 22nd, Midnight - Pale streaks of aurora to the S.E. and to the Wd.  
 25th, 6 p.m. - A large halo round the moon.  
 25th, 8 p.m. - A large halo round the moon.  
 25th, 10 p.m. - A very bright broad halo round the moon, its inner edges of a dark orange colour.  
 25th, Midnight - A pale streak of aurora to the N.  
 26th, 8 p.m. - A large faint circle round the moon.  
 27th, Midnight - A large circle round the moon. Sky hazy.  
 29th, 10 p.m. - A pale streak of aurora from S.W. to the zenith.

## FEBRUARY.

- 1st - At 8.30 p.m., the Nn. part of the sky from the zenith to horizon was one blaze of aurora, prismatic colours, broad arches from S.E. to N.W., and bright streaks. The declinometer vibrating between  $106^{\circ} 10'$  and  $105^{\circ} 5'$ , slowly. It lasted for about 10 minutes.  
 1st, Midnight - A few streaks of aurora to the S.E.  
 2nd - Between midnight and 1 a.m. the heavens were completely illuminated with aurora, the Sn. half in broad streaks (horizontal) of intense white light, working round by W. to N.N.E., then resolving itself into beautiful prismatic colours, folding and rolling about with a gradual approach to where I stood. It then dwindled away in bright coruscations, narrow vertical rays, and vanished. At one time it fairly appeared to touch the vane of the Fort flagstaff. I stood nearly under it, and depend upon it, listened with all my power for any noise, but all was quiet. The greatest and most continuous body was S. of the zenith, and during the whole time the declinometer was greatly agitated; at midnight it read  $105^{\circ} 6'$ . When the aurora commenced it moved to  $103^{\circ} 10'$ , vibrating to  $103^{\circ} 40'$ , then  $102^{\circ} 30'$ , vibrating to  $103^{\circ} 10'$ , and at the brightest when so near  $101^{\circ} 30'$ , but only for a short time; then gradually getting up to  $104^{\circ} 39'$ , when it began to get steady, and at 1 a.m. read  $105^{\circ} 30'$ . There was no wind at the time, the thermometer standing at  $-36^{\circ}$ .  
 3rd, 10 p.m. - A single arch of aurora from N.E. to S.W.  
 6th, Midnight - Bright streaks of aurora to the N.  
 11th, 10 p.m. - Aurora very faint and only occasionally. The dip direct  $81^{\circ} 54' 5''$ .  
 12th, 8 p.m. - Single arch of aurora from E.S.E. to W.N.W.  
 17th, Midnight - Aurora to the E. in bright flashes of prismatic colour.  
 21st, 10 p.m. - A large circle round the moon, and a very faint arch of aurora from E.S.E. to W.N.W.  
 27th, Midnight - Faint streak of aurora to the N.

## MARCH.

- 1st, 9 p.m. - Aurora bright to the N.  
 4th, 8 p.m. - Snow driving. Declinometer vibrating very much N. to S.  
 4th, 10 p.m. - Faint aurora to the Nd.  
 5th, 8 p.m. - Aurora to the N.E., low down and faint.  
 5th, Midnight - A faint arch of aurora from E.S.E. to W.N.W.

- 10th, 10 p.m. - Aurora from E.N.E. to W.S.W. round by N., and nearly to the zenith, coruscating in very bright streaks.  
 11th, 8 p.m. - A single streak of aurora to the N.W.  
 12th, 8 p.m. - Pale streaks of aurora to the N.W., low down.  
 12th, Midnight - An arch of aurora from E. to W., and passing S. of the zenith, very bright to the N.E., pale straw colour.  
 13th, 8 p.m. - A pale arch of aurora from E.S.E. to W.N.W., passing N. of the zenith.  
 21st - Much aurora about 11.15 p.m., in long and irregular narrow belts, low down from E. to W., broken arches half way to the zenith, where it became very faint. At 11.20 p.m. it resolved itself into flashes and coruscations of extreme brilliancy, both horizontal and vertical, settling between N. and W.N.W., extending over a space of about  $40^{\circ}$  from a very low altitude, the stars showing bright through it. At midnight it was very light, The declinometer was hardly effected, the dip at the time direct  $82^{\circ} 10'$ , and  $82^{\circ} 15'$ , face E.  
 24th, 6 a.m. - A very heavy fall of snow last night, and now continuing thick. A fall of about 10 inches.  
 26th, 6 a.m. - A very heavy fall of snow last night from 7 to 8 inches.  
 28th, 6 a.m. - Much snow last night.

## APRIL.

- 1st, 10 p.m. - A faint arch of aurora, low down to the Nd.  
 2nd, 11 p.m. - Aurora in the zenith, faint streaks.  
 3rd, 10 p.m. - A faint arch of aurora to the Nd.  
 8th, 10 p.m. - Aurora from E. to W. in a pale uneven arch.  
 9th, 10 p.m. - Faint rays of aurora to the E. and in the zenith, distinctly seen through the clouds.  
 10th, 2 a.m. - Rain this morning.  
 11th, 10 p.m. - A pale broken arch of aurora to the N.W.  
 12th, 10 p.m. - A double arch of aurora from E.S.E. to W.N.W., very pale.  
 23rd, 2 a.m. - Rain during the night.  
 28th - Wild fowl seen to-day, one goose and two ducks.

## MAY.

- 3rd, 10 p.m. - Aurora in the zenith.  
 7th, 5.30 a.m. - The river Liard made a move.  
 7th, 10 p.m. - A faint arch of aurora passing through the zenith from E.S.E. to W.N.W.  
 10th, 1 p.m. - Ice moving in large masses in the Mackenzie.  
 11th, 8 p.m. - Ice moving off fast in the Mackenzie from the Liard.  
 13th, 2 p.m. - Hot sultry weather.  
 15th, 4 a.m. - Heavy rain during the night.  
 17th, 10 a.m. - Hot oppressive weather.  
 30th, 6 a.m. - The Mackenzie ice moved this morning.

## JUNE.

- 15th, 2 p.m. - Very heavy rain, with heavy thunder.

## 1850.—OCTOBER.

- 15th, 8 p.m. - Aurora in two arches from N.N.W. to N.E. Colour, pale yellowish green, faint; also another ray from N.E. towards the zenith to about  $40^{\circ}$ .  
 16th, Midnight - Dull and indistinct rays of aurora from E. by S. to N.



- 21st, 1 a.m. - A few greenish yellow patches of aurora at E. by S., sky nearly covered with cumulus.  
 21st, 8 a.m. - A little thin crust ice coming from the Liard river.  
 22nd, 9 p.m. - Dull gleams of aurora at N. by E. and S.E. by S.  
 23rd, Noon - Considerable crust ice  $\frac{3}{4}$  inch thick, in large patches from the Liard river.  
 24th, 9 p.m. - Hazy. Scud flying fast and low from S.E.; a few faint gleams of aurora at E.S.E. and N.E.  
 27th, 6 p.m. - Aurora extending in an arch from E. by S. to N.N.W., with vertical rays; also rays through the zenith from N.W. to S.E. by E.  
 27th, 9 p.m. - Aurora visible from E. to W. through N., rays also passing through zenith. Declinometer rotating.  
 29th, 9 p.m. - A broad belt of aurora from W.N.W., passing through the tail of the Great Bear, the zenith, and the planet Saturn, to E.  
 31st, 6 p.m. - A broad arch of aurora, extending from E. to N.W. by N., altitude at centre  $15^\circ$ , vertical rays at the N. extremity at irregular intervals.  
 31st, 9 p.m. - An irregular arch of aurora from E. by N. to N.N.W.; altitude at centre,  $10^\circ$ .  
 31st, 10.15 p.m. - A broad belt of aurora right through Orion, wearing (*sic*) Capella; the lower edge through Ursa Major, and the upper rays touching the Pole Star.

## NOVEMBER.

- 2nd - The entire breadth of the river loosely covered with ice.  
 2nd, 9 a.m. - Aurora visible in glimpses through the clouds from N.E. by E. to N.N.W.  
 4th - The river entirely covered, but not crowded, with ice.  
 7th, 6 a.m. - A faint arch of aurora much obscured by clouds, from E. to N.N.W., altitude of centre about  $12^\circ$ .  
 7th, 9 p.m. - Considerable aurora visible, spreading over the northern hemisphere of the sky. Declinometer much affected.  
 15th, 6 p.m. - A faint irregular arch of aurora from E. to N.N.W.  
 18th, Midnight - A very faint segment of aurora from E. to N.E. by N.  
 19th, 6 p.m. - Light vertical rays of aurora at E. and N.N.W., colour pale green.  
 19th, 7.30 p.m. - A finely-coloured irregular arch of aurora from E. to N.N.W.  
 22nd, 9 p.m. - A broad irregular arch of aurora from E. to N.W. by N., central altitude about  $30^\circ$ , faintly tinged with green.  
 26th, 6 p.m. - A dull faint arch of aurora from E. to N. by W., fringing a heavy cloud.

## DECEMBER.

- 1st, 3 p.m. - The ice stopped.  
 1st, 9 p.m. - Aurora visible in an arch from E. to N. by W., central altitude  $18^\circ$ .  
 2nd, 9 p.m. - Aurora displayed in a broad arch, rising at E. by S. (a little to the Ed. of Sirius) passing through the Twins and the Pointers, ending at N.W., central altitude  $21^\circ$ . Folding and vertical rays, in slight motion, near and about the arch.  
 3rd, 9 p.m. - Aurora visible in a broad arch from E.S.E. to N.W. passing through the Twins and the Pointers.  
 3rd, 6 p.m. - Aurora appearing in a succession of vertical rays, following the curve of an arch from E. by N. to N. by W.  
 18th, 6 p.m. - A wide halo round the moon.  
 21st, 9 p.m. - A large halo round the moon.  
 22nd, 6 p.m. - Aurora visible between N. and E., much obscured by clouds.  
 22nd, 9 p.m. - Aurora extending from E.S.E. to W. by N., passing through Capella and Altair.  
 25th, 9 p.m. - A low faint arch of aurora from E. by N. to N.W. by N.

- 27th, 8 p.m. - A light shower of very fine hail. Between 9 and 10 p.m. there was continued display of aurora, varied in form, brilliancy, and position, sensibly affecting the declinometer. At 9 aurora was in a broken irregular arch from W., passing through the zenith, terminating about half way to the horizon at E.N.E., of a pale white light. It was brightest to the Wd., there on the N. side, close to, were several vertical rays of irregular lengths. To the N.N.W. low down, were several parallel bands showing faintly through light luminous clouds, the declinometer was then reading  $105^\circ 26'$  and  $285^\circ 6'$ . From this time to 9.50 the instrument had a gentle rotary motion to  $106^\circ$ , with beams, streamers, and rays of light varying in brightness, but all to the north of the zenith. At 9.55 it was spread all over the heavens in faint patches showing through the light clouds, except at W.N.W. and E.S.E., where there were bright broad bands. The wind was gentle from E. The instrument then read  $107^\circ 9'$  and  $206^\circ 39'$ . Soon after it began to disperse and the instrument returned to the reading of the day.  
 28th - From 5.30 p.m. until about 8.30 aurora was visible, in broken patches of a broad line, between E.N.E. and N. by W.

## 1851.—JANUARY.

- 9th, 9 p.m. - Aurora dimly displayed in a long, irregular, and broken arch from E. by N. to N.W. by N.  
 10th, 11 p.m. - Aurora was finely displayed in an irregular arch from E. by S. to N.W. by N., with a spreading mass at its eastern base, the colour a pale greenish yellow.  
 11th, 6 and 9 p.m. - A large and broad halo round the moon.  
 13th, 9 p.m. - Aurora forming a low arch from E.N.E. to N.  
 15th, 9 p.m. and Midnight. - A large halo round the moon.  
 16th, 6 p.m. - Aurora visible in an irregular arch of curtain form, from E. by S. towards W. by S.  
 16th, 9 p.m. - Declinometer vibrating. Aurora visible in a low irregular arch from E. by S. to W.  
 17th, 6 and 9 p.m. - Mercury frozen in the open air.  
 17th, 11 p.m. - Aurora visible in a succession of short arches from E. by N. to N.W. by W.  
 19th, 6 p.m. - Aurora visible in a dull arch, with vertical rays from E. by S. to N.W. by N.  
 21st - From 5.30 until past 11 p.m., aurora was constantly N. of the zenith; most frequently in a series of irregular arches from E. to N.W., extending nearly to the zenith; showing vertical rays.  
 22nd, 9 p.m. - Aurora dully displayed in a broad belt from E.S.E., passing through the zenith to W.N.W.  
 23rd, 6 p.m. - A dull arch of aurora from E. to N. by W.  
 23rd, 9 p.m. - Aurora visible in two dull arches from E. to N.N.W.  
 25th, 6 p.m. - Aurora visible in an arch from E. to N.N.W., with vertical rays.  
 27th, 6 p.m. - Aurora visible in an arch from E. to N.N.W.  
 27th, 9 p.m. - Aurora visible in an arch from E. by S. to N.W. by N.  
 28th, 9 p.m. - A very faint arch of aurora from E. by N. to N.W. by N.  
 29th, Noon - Clouds of cirro-stratus forming arches from E. to W. and W.N.W.  
 30th - About 2 inches depth of snow fell during the night.

## FEBRUARY.

- 1st, 9 p.m. - A faint arch of aurora from E. to N.N.W., with a few short vertical rays at the Nrn. extremity.  
 4th, Midnight - A faint arch of aurora extended from E. by S. to N.W. by N., edging a bank of nimbus, through which, below, a second arch, still more faint and ill-defined, was displayed.  
 8th, 9 p.m. - Aurora was displayed in two faint arches, one from E. by S. to N.W. by W.; the other from E.S.E., passing through the zenith from W.N.W.  
 Between 10.50 and 11.5 p.m., aurora was very brilliant in streamers, vertical rays, serpentine bands, and broken arches, the latter slightly tinged with colour, very pale



green. In the zenith over a considerable space, E.S.E. and W., were faint lights, slowly changing position and form, having something the appearance of light, fleecy clouds. This display was all to the N. of the zenith; the coloured parts between it and the horizon. The declinometer at the time gently vibrating between  $105^{\circ} 36'$ , and  $106^{\circ} 16'$ . At 11.20, aurora was all over the heavens in faint lights, having no particular form or size, except to the N. and W., where it was in large irregular patches of rainbow colours, with a continuous folding motion, like a curtain agitated by a light wind. The motion of the declinometer was then somewhat quicker, but not higher than  $106^{\circ} 20'$ . From about this time till a little before midnight it was in every part of the heavens and varied in form, with the brightest portion in continual motion. Very bright, a little E. of the zenith in a long, narrow, serpentine band; dense and particularly bright over the whole constellation of Orion, the smaller stars just showing through when it broke away into auroral corona, then fading gradually; when at midnight it was all gone but a light streak low down to the N.N.E., and a few small patches to S.E. and W. The declinometer at the brightest was up to  $107^{\circ} 14'$ , then gradually returning to the reading when no aurora. At midnight, it was  $106^{\circ} 40'$ . At the time there was a light air from S.E., the thermometer  $-31^{\circ} \cdot 2$ .

7th, 12.15 a.m. Aurora was presented in a broad serpentine curve across the sky from E. to W.N.W.; of irregularly indented outline, and being to the Ed., doubled under and returned in an almost parallel line to about one half of its entire extent; the prismatic colours were slightly displayed, and the entire mass undulated gently with waving and folding motion. From E. to S.E. streamers extended at intervals to the zenith, in and about which a few light patches were situated. The main colour was a pale greenish light, broken occasionally by purple shades. At 12.25 a new phase appeared, the mass breaking into lines and patches, mostly of curtain form; then agitation became more violent, the colours more vivid, and the positions less constant. All was to the N. of the zenith excepting a solitary ray, or streamer, which, commencing in the E.S.E., and passing a few degrees S. of the zenith, extended more than half way down to the horizon at W.S.W. At 12.40 the whole had retired, leaving only a very few light patches and streamers in the Nrn. sky, and a light bush in the Ern. horizon, from which a number of short and bright vertical rays of golden hue proceeded. At 12.50 a low arch extended from E. by S. to N. by W., well defined and very luminous, of a pale green tint. At 1 the arch had become raised, and extended its limits a point on either side; it was now crowded with vertical rays and purplish shades.

9th, 8 p.m. - Aurora visible in an arch from E.S.E., passing through the extremity of the tail of the Great Bear to N.W., of a dusky but pale greenish tinge.

9th, 9 p.m. - A huge patch of the same hue visible from E.N.E. to N.N.E.

12th, 9 to 11.30 p.m. A halo round the moon.

14th, 8 to 11.30 p.m. A wide halo round the moon.

18th, 6 p.m. - While there was yet considerable daylight, aurora was displayed in a thin curved line, between S.S.W. and W.N.W., passing through Orion and the Pleiades, and a few degrees S. of the zenith. As the darkness increased, aurora was finely and profusely displayed in various forms. At 8.30 the greater part of the Nrn. and also much of the Srn. sky near the zenith was overspread with broad, undulating, and fringe-like lines of curtain form, so thickly crowded with vertical rays that they seemed as if composed of such. In the zenith a crowd of like rays converged, forming what would have been aurora coronæ, but that they were not exclusively to the Sd. of the zenith, being, in fact, for the most part to the north. The main colour was a bright and greenish yellow, dark purple shades occurring occasionally; a slight motion was observable throughout. Later a bright red coloured mass was observed to the Sd. with considerable motion. At 11

patches and streamers were visible between S.S.E. and W., near the horizon, and of a bright yellow of a greenish cast. At midnight several nearly parallel curves were disposed near the horizon, between S.S.E. and S.S.W., commingled with a bank of stratus clouds, and of a dull and dingy yellow. A few patches and narrow vertical streamers of plain light were also visible. The declinometer, on inspection, did not appear to be affected.

19th, 6.30 p.m. - A narrow transverse band of aurora, faint and irregular, extended from E.S.E. through the zenith to W.N.W.

21st, 11.30 p.m. A broad serpentine band of aurora extended from E.S.E., through the zenith, to W.N.W., rather dull, of a dingy yellow tinged with green. The weather was misty, very fine snow falling, wind very light from Wd. Around the horizon were heavy banks of nimbus; the upper part of the sky was clear of clouds.

22nd, 8.30 a.m. A parhelion observed in a prismatic segment to the eastward of the sun.

22nd, 10.30 p.m. Aurora appeared in a broad transverse band of dull diffused light, extending from E. by S. to W.N.W., passing through the tail of the Great Bear. Two narrow bands, from the same points and of faint light, passed through the zenith, as perfectly regular and defined in outline as if two ribands stretched across the sky; the space below them, of the same width as each, appeared very dark, either so by contrast with the light, or itself a dark ray. To the northward a faint diffused light appeared over dark haze or clouds on the horizon, through which the stars were not perceptible. At 11 aurora commenced in an immense mass or bush, which occupying the space between E.N.E. and E.S.E., and covering the entire constellation of Ursa Major, gradually narrowed after passing the zenith, and thence continued, in a well-defined serpentine band of moderate breadth, to W., passing a little to the N. of the Pleiades. The eastern base was of scroll or curtain character, with considerable motion towards E., and in it prismatic colours were finely developed, red and violet hues predominating. The whole display was of a very bright greenish golden colour, or rather light. To the Nd. a few light and faint vertical patches were visible. At midnight a serpentine arch or head, composed of a series of vertical lines in continual motion throughout its length and vertex, sinking slowly towards the S.W. horizon, extended from E.S.E., passing considerably to the S. of the zenith, to W., and in this colours were finely, though transitorily, displayed, the main colour being as before. Five minutes after midnight this arch suddenly dispersed itself over all the sky N. of, and also over much S. of, the zenith, in beams, rays, streamers, and every imaginable collection of lines, the most remarkable, however, being innumerable vertical patches, all bright and all in motion, and a brilliant but narrow serpentine band, a perfect fringe of blazing light, rose at E., and ran, at a small distance above the horizon, through N. to W. Weather calm and clear throughout.

25th, 9 p.m. - An arch of aurora from E. to N.W., passing just below the tail of Ursa Major; bright from its Ern. extremity to the centre, thence gradually fainter to N.W. A faint undefined light to the Nd., considerably below the arch, and appearing above a heavy bank of nimbus.

26th, 9 p.m. - A very faint low arch of aurora, extending from E. by N. to N.W. by N.

### MARCH.

2nd - - Much snow fell during the night; wind strong from Ed.

2nd, 9 p.m. - Aurora extending from E.S.E. to N.W. by N. in a diffused light, defined by an arch below, passing through the tail of Ursa Major.

5th, Midnight - A broad irregular transverse band of aurora from E. to N.W. by N., passing just below the Great Bear; masses of cumulus considerably below passing slowly across its path. Aurora of moderate brightness.



- 6th, 10.30 p.m. - An arch of aurora, faint, extended from S.E. by E. to W.N.W., passing through the tail of the Great Bear. Sky clouded and misty.
- 7th, 8.45 p.m. - Faint patches of aurora visible near the zenith, showing through clouds of mist.
- 7th, 10 p.m. till Midnight. - Intermittent appearances of aurora in beams, rays, and streamers, N. of zenith.
- 7th, Midnight - Aurora overspreading nearly the entire Nrn. sky; a narrow serpentine band leading from E. to N.W. by N., low down towards the horizon; a considerable mass, with streamers, S. of zenith. Auroral corona also visible. Sky clouded and misty. Aurora faint, excepting the transverse band, which was of moderate brightness and bore a bluish hue.
- 9th, 9 p.m. - Considerable aurora to the Nd., much obscured by clouds and mist.
- 10th, 9 p.m. - A wide halo round the moon.
- 11th, 9 p.m. - Faint streamers of aurora, proceeding from between N. and N.W. towards the zenith; colour, a pale greenish light.
- 11th, 10 p.m. - An irregular transverse band, or series of lines in that form, extending from E.S.E. through the zenith to W. by N. passing just below the Great Bear.
- 11th, Midnight - Faint lines and patches dispersed over the Nrn. sky, also a few streaks to the Sd. of W. Colour as before.
- 12th, 9 p.m. - A large and broad halo round the moon. A faint thin arch of aurora from E. by N. to N. by E.
- 12th, Midnight - Halo still round the moon.
- 15th, 9 p.m. till Midnight. - A large halo round the moon.
- 18th, 9 p.m. - A very faint diffused light was visible between N. and W., over a light bank of haze.
- 18th, Midnight - A few light patches of luminous haze or cloud visible; and between S. and S.W. a faint undefined, diffused light, a little above the horizon. The upper portion of a very faint halo, formed around the moon.
- 19th, 9 p.m. - A very faint outline of an arch between N. and E., low.
- 22nd, 9 p.m. - Aurora was visible in irregular lines of diffused light, mixed with nimbus clouds and interspersed by short, dark vertical rays and coruscations; it extended unevenly and interruptedly from N.W. to E.S.E. passing through the Great Bear; the appearance was dull though distinct, and of a greenish cast, with some purplish shades, and to the Ed. assumed slightly the curtain form. Declinometer vibrating slightly.
- 22nd, 10.45 p.m. - Aurora extended from a widely spreading mass at E.S.E. towards W.S.W., passing about midway between the Sn. horizon and the zenith; it was a pale greenish light of moderate brightness. Wind W.N.W., light. Some fine misty particles falling.
- 26th, 10 p.m. - Aurora faintly diffused to the Ed.
- 26th, Midnight - A faint but well-defined narrow arch of aurora extending from E.S.E. to W.N.W.
- 27th, 9 p.m. - An undulating arch of diffused light, well defined below, and of moderate brightness, extending from E. to N.W., passing through the zenith, and a little below the Great Bear; from E. proceeded a bush of vertical rays and short streamers. At 10.55 aurora was dispersed all over the sky in diffused light, short streamers and patches of vertical rays. Two narrow ribands extended from E.S.E. through the zenith to W.N.W.; from E. to W.N.W. proceeded a perfect arch of short rays, and from S.E. to S.W. by S. extended a broad low arch of dull diffused light. Scarcely any part of the sky was clear of aurora in one or another form, varying from faint to moderate brightness and uncoloured. At 11 the before-mentioned arch of rays, much altered in appearance, was projected through the zenith from W.N.W. to E.S.E., recurving from the latter point back to E. At 11.5 it had again slightly changed in appearance and position, now extending from W. by N. to S.E. by E., passing through the zenith and forming auroral corona, a few degrees S.S.E. of it; these last displays were very fine, although not of excessive brightness. At midnight all had disappeared, a very long low arch now only displayed, extending from S.E. by E. to S.W. by W., with vertical coruscations and diffused light extending as far as E. Declinometer unaffected throughout.

- 28th, 8 p.m. till Midnight. - Aurora was constantly and beautifully displayed, in long serpentine bands, rays, and streamers, and at N. and S. low arches; that at N. well defined and bright, with short vertical coruscations; that to the S. extending from S.E. to W.S.W. of dull diffused light, over dense clouds, through which no stars were visible. In the early part of the evening the aurora was uniformly of a bright, nearly grass-green tint, but later assumed the ordinary hue of pale light. There was considerable irregular motion throughout the curtain bands. The display was mostly N. of the zenith, but there was at times also much S. of it. At midnight the display of bands, &c. had, though still considerable, much decreased; the arch at S. alone remaining unaltered. Declinometer unaffected throughout.
- 29th, 8 till 11 p.m. - Aurora was displayed as last night, bounded by similar arches to the N. and S.
- 31st, 9 p.m. - Aurora, forming a flattened arch from E.S.E. to N.W. by W., with irregular coruscations; under it, over a heavy bank of nimbus, was a faint arch of diffused light imperfectly developed.

## APRIL.

- 1st, 9 p.m. - Light rays of aurora to the N.N.W.
- 2nd, 9 p.m. - A faint arch of aurora from N.W. to E.S.E.
- 3rd, 9 p.m. - A serpentine band of aurora proceeding from a mass of curtain light at E., extending through the zenith to W.
- 7th, 9 p.m. - A plain serpentine band of aurora, extended from E.S.E., considerably S. of zenith, to W.; other rays also diverged from E. Colour pale greenish yellow.
- 8th, 10 till 11.20 p.m. - An arch of aurora extending from E. by S. to N.W. by N. of a pale yellowish green.
- 9th, 9 p.m. - A broken halo round the moon.
- 10th, 9 p.m. - A narrow segment of aurora extended from E. by S. towards N.N.W.; faint, and of a pale greenish hue.
- 11th, 9.50 p.m. - Sky covered with cumulus. A curious beautiful halo of rainbow colours round the moon.
- 12th, 10 p.m. - An irregular arch of aurora from E. to W. by N., pale yellowish green.
- 13th, 9 p.m. till past 11. - A wide halo round the moon.
- 14th, 9 to 11 p.m. - A mock moon visible on either side of the true moon, in a wide halo round that body.
- 15th, 9.30 p.m. - A mock moon visible to the Ed. of the true, in a wide halo round her.
- 19th - - Wild fowl first seen. Between 11 and 12 p.m. aurora was finely displayed in a series of serpentine bands, passing from E. to W., S. of the zenith.
- 22nd - - Much snow fell during the day.
- 23rd - - Snow about 4 inches deep on the ground.
- 24th, 11 p.m. - Aurora was presented in a huge convex mass of light, between the points E.N.E. and N.N.W. lying along the horizon. Clouds of cumulo-stratus appeared, low down.
- 24th, Midnight - Only a faint diffused light was apparent to the N.E.
- 25th, Midnight - Aurora moderately bright and tinted with yellowish green, commenced in a broad scroll at E. by S., and extended in a plain serpentine band, thence nearly to the horizon at W., passing a little S. of the zenith. A light purple hue, occasionally perceptible in the scroll, which was in slight internal motion.
- 26th, Midnight - Aurora displayed to the N.E.
- 27th, Midnight - Aurora displayed to the Ed.
- 28th, 9 p.m. - Aurora displayed for an instant to the Ed.



## MAY.

- 1st, Noon - A large prismatic circle was formed round the sun, and at 7 p.m. a similar one was presented with another, imperfectly formed, outside of it. In the inner circle, S. of the sun, was a parhelion, and another, but very faint, to the N. Faint rays of light radiated from the outer edge of the inner circle, and directly above the sun a very bright light was visible.
- 1st, 11 p.m. till Midnight. Aurora was finely presented in curtain serpentine bands, in constant motion; and auroral coronæ which formed round the tail of the Great Bear and extended, at one period, thence to the horizon. The display was not generally brilliant, but sometimes appeared to concentrate, and then formed masses of powerful light, which illuminated the night almost as much as the full moon would do. The colour was dull pale greenish with very little alteration, occasionally only very light purple and violet hues were visible.
- Until midnight all was almost entirely S. of the zenith, but just at that time it drew across to the N. and E., and spread all over the sky in light pale vertical lines. The declinometer was perfectly steady.
- 4th, 4 p.m. - The ice from the Liard river made its first start, but stopped and proceeded repeatedly during the evening and night.
- 6th, 7.30 p.m. - A parhelion, in a prismatic segment, to the N. of the sun.
- 9th, 11 p.m. - An irregular curtain streamer of aurora to the Wd., of a beautiful bright golden green.
- 12th, 11 p.m. - Aurora of a pale greenish yellow, visible in a slight arch to the Sd.
- 14th - Two circles round the sun, the outer composed rather of bright parhelion.
- 17th, 8.30 p.m. - The Mackenzie river ice began to drive in heavy masses.
- 21st - The river is rising. A great quantity of small ice driving from the upper part of the river.
- 26th - River still rising.
- 27th, 3 p.m. - A heavy gathering of clouds from W. to S., a few flashes of lightning and distant thunder. The clouds coming up fast against a moderate breeze from E., which at 6 fell quite calm, and we had some heavy rain.
- 29th - The river Liard is rising. A large circle round the sun.
- 31st, 2.15 p.m. - A heavy squall from W.S.W. with rain, and an occasional peal of thunder.

## No. XXII.

## Results of Meteorological Observations made during the Arctic Drift of the "Advance" and "Rescue."

THE "Advance" and "Rescue," under command of Lieutenant Edwin De Haven, U.S.N., in September 1850, were beset in the ice and drifted into Wellington Channel as far as latitude  $75^{\circ} 24' 52''$  N., whence they drifted through Barrow Strait, Lancaster Sound, and down Baffin's Bay till June 6th, 1851, when they were liberated in latitude  $66^{\circ} 32' 53''$  N., longitude  $59^{\circ} 6' 17''$  W. The results of the meteorological observations made during this perilous voyage have been computed from the data contained in the narrative of the expedition published by Dr. E. K. Kane, M.D., entitled, "*The U.S. Grinnell Expedition in search of Sir John Franklin.*"

"The state of the weather and direction and force of wind were noted hourly; the daily mean and the *true* direction have been given in the abstract. Three-hourly observations (with some exceptions) were made for the temperature of the air, and water, and atmospheric pressure, of which the daily mean readings are given in the abstract. The readings of the aneroids are given uncorrected, as mere approximations." The force of the wind and the state of the weather were recorded by Beaufort's methods.

The meteorological abstract forming Kane's Appendix C., was drawn up by Mr. C. Schott, of the United States Coast Survey.

Table I. contains the true direction and distance in nautical miles which the "Advance" was carried by the ice-drift between the positions of the ship as determined from time to time by celestial observations.

Table II. shows the monthly means of the aneroid readings, also the highest and lowest of the mean daily readings of the aneroid, with the day's temperature, wind, and weather. The aneroid undoubtedly indicated too high, and of course the results are only of use differentially. Thus they show that pressure was greatest in April, least in January; the maximum occurred in February, the minimum in September, and that the range was 1.83 inches. The air was colder, the weather finer, and there was less wind with the high than with the low pressures.

Table III., in a similar manner to Table II., shows the mean monthly temperatures of the air, also the greatest and least of the mean daily temperatures, with the day's mean reading of the aneroid, wind, and weather. The coldest month was February,  $-29^{\circ} 6'$ ; and the coldest day,  $-41^{\circ}$ . The low temperatures appear to have been attended with finer weather and less force of wind than the high temperatures. On February 6th, it is stated, "the thermometer used stood at  $-39^{\circ}$ , when the mercury in the artificial



horizon was freezing;" this indicates that the instrument was not in error more than  $1^{\circ}$ , and that too low.

Table IV. gives a monthly summary of the daily mean true direction of the winds, from which it appears that the most frequent winds were N.N.W. in September, N. in October, S.E. in November, W. in December and January, W.N.W. in February, N.W. in March, S.E. and N.W. in April, N.W. in May. The S.E. winds of November do not appear much to have influenced the S.Ely. drift, but those of April seem to have considerably arrested it. In the other months the drift seems to have been favoured by the winds.

Table V. contains a monthly summary of the weather, from which it is evident that if mist be left out of consideration, the atmosphere was clearest in March, and most obscured in September; but mist was most common in March and fog in September. No snow fell in December or February.

The following quotations from Dr. Kane's narrative have been selected for the interest which they possess in relation to meteorology:—

1851, January 29th. "Our thermometric records on shipboard cannot be relied on. I mention the fact for the benefit of those who may hereafter consult them. My wooden case Pike thermometer, hung to a stanchion on the northern beam of the brig, gave at noonday  $-19^{\circ}$ , exposed to the sun's rays on the southern,  $-14^{\circ}$ . The observation repeated at 12h. 30m. gave  $-20^{\circ}$  for the northern, and  $-15^{\circ}$  for the southern side, the difference in each case being  $5^{\circ}$ . The same thermometer, carefully exposed about a hundred yards from the ship, gave at noon on the north and windward side  $-21^{\circ}$ ; on the south, exposed to the sun,  $-18^{\circ}$ ; and at thirty minutes afterwards (nearly), on the north,  $-20^{\circ} \cdot 5$ , towards the sun  $-16^{\circ}$ . The difference in these last observations of  $3^{\circ}$  in the first and  $4^{\circ} \cdot 5$  in the second, was owing unmistakably to the effect of the solar rays. The ship's record for the same hours was simply  $-19^{\circ}$  and  $-18^{\circ}$ . The fact is that there is always a varying difference of  $2^{\circ}$  to  $5^{\circ}$  of temperature between the lee and weather sides of the brig; the quarter of the wind and its intensity, the state of our fires, the open or shut hatches, and other minor circumstances, determining what the difference shall be at a particular time."

1851, February 8th. "We had several displays of paraselenæ in the early days of the month, and an almost constant deposition of crystalline specks, which covered our decks with a sort of hoar frost. The rate of this deposition on the vessel was about a quarter of an inch in six hours, but in an ice basin on the floes, surrounded by hummocks, and thus protected from the wind, I found it nine inches deep. When accumulated in this manner it might, on a hurried inspection, be confounded with snow; but it differs as the dews do from rain. It is directly connected with radiation, and is most copious under a clear sky. Snow itself, the flaky snow of a clouded atmosphere, has not been noticed by us when the temperature was lower than  $-8^{\circ}$ , or at most  $-10^{\circ}$ ."

"It might be supposed at first view that the accession of solar light would be

accompanied by increase of temperature. This, however, was far from being the case. Though February had brought back the sun, it was the first month throughout which the ice fields remained frozen in their wintry rest. It was our coldest month. This effect was due to the greatly increased evaporation, a subject of frequent notice in my journal, confirming in this the experience of Erman and other Siberian travellers.

"The renewed alternation of day and night, with their increased range of diurnal temperatures, gave us in full perfection those different forms of meteoric exhibition which affect peculiarly the arctic zone. The aurora with a host of phenomena dependent upon the modifications of light, halos, coronæ, tangent circles, parhelia, anthelia, and paraselenæ, came to us in rapidly varying succession, and refraction with its preternatural augmentation of the visual hemisphere, revisited us under new and startling forms.

"The scintillation of the stars, that phenomenon so connected with alternating changes in the refractive media, was wonderfully apparent. The fixed stars, whose distance made the least displacement sensible to the eye, were especially influenced; yet even the planets shared in the change, and twinkled like the stars at home. I have alluded to the gorgeous changes of Sirius and Aldebaran; but these descriptions give a feeble index of their protean varieties of shape and colour, which, with every grade of intensity, greeted us nightly.

"The red colouring of the clouds reminded me of the rose tints of the Alps. Cirro-cumuli of every imaginable form began again to deck the horizon. The twilight, too, that long arctic crepusculum, seemed, contrary to theory, to be disproportionately increased in its duration. Eighteen degrees is a very arbitrary limit to its extent."

1851, February 7th. "Cold and clear; thermometer, at 8.40 a.m., at  $-38^{\circ}$ , while on the vessel's stern; and at  $-42^{\circ}$  when freely suspended by the bows outside: my Green's spirit standard, some fifty paces from the vessel, at  $-48^{\circ}$ ; one more illustration of the local influences of shipboard, and of the irregularity of our system of registration.

"The sun was completely visible at about 10 a.m.; but his rays were subdued by a slight haziness, caused by myriads of crystallized specks that filled the atmosphere. These, when examined by my travelling Fraunhofer at two hundred diameters, gave in some few cases regular hexagonal prisms, with well-defined terminations; but this symmetry of form was generally obscured by groupings, and long oblique truncations. I have now made eight careful examinations of these crystalline spiculæ at varying temperatures, when they came to us accompanied by parhelia, halos, or anomalous columns proceeding from the sun. In every case there was a decided approach to the six-sided form."

1851, February 28th. "The clouds are of a sort seldom seen, except in the conceptions of adventurous artists, quite undefinable, and out of the line of nature, defying Howard's nomenclature. They are blocked out in square stormy masses,



against a pearly, misty blue, harsh, abrupt, repulsive, quite out of keeping with the kindly lightness of things belonging to the sky.

"The lowest temperature we recorded during the cruise was on the 22nd of this month, when the ship's thermometer gave us  $-46^{\circ}$ ; my off-ship spirit,  $-52^{\circ}$ ; and my own self-registering instruments, purchased from Green, placed on a hummock removed from the vessels,  $-53^{\circ}$ , as the mean of two instruments. This may be taken as the true record of our lowest absolute temperature." Latitude  $72^{\circ}$  N., longitude  $68^{\circ}$  W.

1851, March 13th. "From the beginning of the month the skies had undergone a sensible change of aspect. Instead of the heavy banked or linear stratus about the horizon, and the light, cold cirri above, we were getting back to something like the "fall" skies of our own climate, the misty bands of morning becoming fleecy as the day wore on, and taking the marbled or mackerel character before they blended with the western skies."

"We had no actinometer to mark the daily increments of solar radiation; our thermometers were generally of rude construction, and were not so placed as to give the highest value to their results; and an entry which I find in my journal explains why my barometrical records were so few."

1851, March 12th. "To-day, for the first time during the cruise, I had the pleasure of seeing our mountain barometer released from its stowage, and an attempt made to compare it with our aneroids. Before we began our drift to the north, when we had no fires below to give us a constantly vibrating temperature, and the aneroid of the "Rescue" had not come into the overcrowded cabin of our vessel to divide the formalities of registration with our own, it might have been well to make a careful comparison of the two with those of the British vessels; and with our mountain barometer also. The index error of this instrument on its zero point could have been adjusted then by reference to others that were just from Greenwich, and it would have been practicable, perhaps, to give something of increased value to our log-book records of the atmospheric pressure. Under all the circumstances, I have not thought it necessary to transfer them to my journal."

1851, April 7th. "For the last fortnight the ice has been perceptibly moist at the surface. The open crack near our brig to the south has now been closed for nearly a fortnight, yet the snow which covers it is quite slushy. The trodden paths around our ship are in muddy pulp, adhering to the boots. All this can hardly be the direct influence of the sun upon the surface, for the thermometer seldom exceeds  $+16^{\circ}$ , and is more generally below  $+10^{\circ}$  at noonday. Yet this temperature has an evident influence upon the status of the ice, increasing its permeability, and permitting some changes analogous to thawing, but which I cannot explain. May it be that the crystalline structure of the ice is undergoing some modification, that increases its capillarity, or develops an action like the endosmose and exosmose? It is a mere puzzle, of course, for we have not data enough to make it a question. Yet there is another like it that I cannot help setting down. Can it be that our thermometers, so notorious

in this Polar region for their imperfect coincidence with sensations of cold, are equally fallacious as measures of absolute increments or decrements of sensible caloric? It will not do, I suppose, to admit such a supposition, yet the marvels which come constantly before me may almost justify it. You know that I am no heat-maker. Well, my winter trials, as you may imagine, have not increased my vital energies. Suppose me, then, as you knew me when I left New York. For the past week I have almost lived in the open air—genial, soft, bland, and to sensation just cool enough to be pleasantly tonic. I walk moderately, and am in comfortable, glowing warmth. I walk over the hummocks or ice-floes, and am oppressed with perspiration and lassitude. This at a temperature of zero in the shade, and  $+11^{\circ}$  in the sun!!! I cannot realise it. To-day the thermometer gave  $+10^{\circ}$  in the shade of the ship, obviously affected not a little by radiation,  $+34^{\circ}$  in the sun over the ship's painted side,  $+13^{\circ}$  by my own observation of an instrument suspended at a distance from the ship, and under the same circumstances in the shade, *zero*! Yet the day seemed spring-like and delicious. The early breezes (8 a.m.) from the south-east came with a sensation of reviving coolness, although to their warmth we perhaps owed our sensations of pleasant heat. While I am writing the skaters come in to say that 'it is too warm to skate'; yet the sun is low, and my shade thermometer gives some  $10^{\circ}$  below the point of freezing.

"I have often alluded to this discrepancy between our feelings and the recorded temperature. I have read of the same thing in the arctic voyages, with a reference to contrast for the explanation. But I never, until to-day, realised so fully that we were warmed from within by a mysterious, and I must believe, unknown system of functional compensation."

1851, May. "For the last four days of the month we were at the margin of the arctic circle, alternating within and without it. We passed to the south of it on the 30th, to recross it on the 31st, with an accidental drift to the northward. We were experiencing at this time the rapid transition of seasons which characterises this climate. The mean of the preceding month, April had been  $+8^{\circ}$ ; that of May was  $20^{\circ}$ , a difference of  $12^{\circ}$ . At the same time there was a chilliness about the weather, an uncomfortable rawness, both in April and May, which we had not known under the deep perpetual frosts of winter. Cold there seemed a tangible, palpable something, which we could guard against or control by clothing and exercise; while warmth, as an opposite condition, was realizable and apparent. But here, in temperatures which at some hours were really oppressing,  $60^{\circ}$  to  $80^{\circ}$  in the sun, and with a solar altitude of  $45^{\circ}$ , one half the equatorial maximum, we had the anomaly of absolute discomfort from cold. I know that hygrometric conditions and extreme daily fluctuations of the thermometer explain much of this; but it was impossible for me to avoid thinking at the time that there must also be a physiological cause more powerful than either."



TABLE I.  
DRIFT OF THE "ADVANCE," 1850-51.

Date.	Latitude N.	Longitude W.	Direction.	Distance.
September 14th -	74 40 0	93 0 0	—	Miles.
October 2nd -	75 24 52	93 31 10	N. 31 W.	48
" 7th -	74 54 7	93 9 52	S. 11 E.	30
" 11th -	74 44 17	92 48 17	S. 28 E.	12
" 12th -	74 54 32	92 54 14	N. 9 W.	10
November 18th -	74 36 53	91 45 45	S. 46 E.	25
December 15th -	74 20 6	86 26 16	S. 79 E.	87
" 18th -	74 20 32	85 11 30	S. 88 E.	20
" 28th -	74 18 8	82 10 18	S. 87 E.	51
January 18th -	74 46 49	75 3 24	S. 76 E.	118
" 26th -	73 9 13	72 2 21	S. 53 E.	62
" 28th -	72 52 45	71 15 35	S. 39 E.	21
" 29th -	72 49 15	70 59 15	S. 53 E.	6
February 9th -	72 19 40	68 56 22	S. 52 E.	48
" 14th -	72 15 9	68 40 22	S. 45 E.	7
" 20th -	72 10 11	68 36 40	S. 13 E.	5
March 4th -	71 54 57	66 55 48	S. 66 E.	35
" 15th -	71 27 59	65 44 30	S. 38 E.	36
" 24th -	70 55 9	64 4 0	S. 45 E.	46
" 26th -	70 43 56	63 44 33	S. 36 E.	14
April 1st -	70 37 30	63 42 0	S. 7 E.	7
" 4th -	70 10 0	63 24 7	S. 13 E.	28
" 8th -	70 0 50	63 18 42	S. 12 E.	9
" 13th -	70 12 34	63 2 50	N. 25 E.	13
" 15th -	70 9 0	63 19 52	S. 26 W.	7
" 16th -	70 7 13	63 0 3	S. 78 E.	7
" 19th -	69 52 50	63 3 22	S. 3 W.	14
" 23rd -	69 52 1	63 2 6	S. 28 E.	1
" 26th -	69 39 42	63 8 46	S. 9 W.	13
" 29th -	69 24 40	63 4 26	S. 6 E.	15
May 3rd -	69 9 0	63 1 50	S. 4 E.	16
" 9th -	68 41 40	62 1 55	S. 38 E.	35
" 15th -	68 12 45	61 42 53	S. 14 E.	30
" 16th -	68 4 24	61 14 2	S. 51 E.	13
" 21st -	67 10 42	60 25 0	S. 19 E.	57
" 23rd -	67 0 0	60 37 6	S. 23 W.	12
" 26th -	66 40 42	60 54 49	S. 24 W.	17
" 27th -	66 41 40	60 54 45	S.	3
" 28th -	66 33 41	60 52 45	S. 6 E.	8
" 30th -	66 28 0	60 28 20	S. 60 E.	11
" 31st -	66 29 4	60 11 42	N. 82 E.	7
June 1st -	66 32 39	59 50 46	N. 67 E.	9
" 3rd -	66 30 50	59 34 38	S. 75 E.	7
" 4th -	66 31 22	59 19 25	N. 85 E.	6
" 5th -	66 32 53	59 6 17	N. 75 E.	6

TABLE II.  
MONTHLY MEAN AND EXTREMES OF THE MEAN DAILY READINGS OF ANEROID, and accompanying TEMPERATURE, WIND, and WEATHER, during the DRIFT of the "ADVANCE," 1850-51.

Month.	Mean.	Day.	Highest.	Temp.	Wind.	Weather.	Day.	Lowest.	Temp.	Wind.	Weather.	Range.
September	inches. 29.98	8	inches. 30.71	+25.2	N.N.E. 3	o s f	20	inches. 29.18	+27.8	N.E. 4	o	inch. 1.53
October -	30.16	15	.73	-1.2	N. 1	b	2	.85	10.8	N.W. 2	o m s	.88
November	.19	26	.68	13.0	S.S.E. 2	b m	10	.50	+6.6	E.S.E. 9	b o m	1.18
December	30.05	8	.40	12.7	E.N.E. 6	"	31	.47	-26.8	W. b. S. 2	b m	.93
January -	29.84	26	30.33	9.7	N.b.W. 2	o m	31	.35	-4.4	N.W.b.W. 3	o s	.98
February -	30.10	27	31.00	32.3	E. 2	b m	1	.26	-11.7	W. 2	c o b m	1.74
March -	.06	31	30.75	-4.4	N. b. E. 2	"	2	.42	-1.2	W. b. S. 4	o m s	1.33
April -	.40	14	31.01	+14.6	V'ble 1	o m s	10	.71	+25.5	S.E.b.E. 6	o m	1.30
May -	30.23	9	30.82	+14.7	S.W.b.W. 2	b c	25	29.66	+23.2	N.W. 7	c m s	1.16
	—	April	31.01	—	—	—	Sept.	29.18	—	—	—	1.83

TABLE III.  
MONTHLY MEAN TEMPERATURE OF THE AIR, with the HIGHEST and LOWEST MEAN DAILY TEMPERATURES and accompanying MEAN HEIGHT of the ANEROID, WIND, and WEATHER, during the DRIFT of the "ADVANCE," 1850-51.

Month.	Mean.	Date.	Highest.	Aneroid.	Wind.	Weather.	Date.	Lowest.	Aneroid.	Wind.	Weather.
September	+21.8	2	+35.5	inches. 30.03	V'ble 2	o f	28	+5.0	inches. 30.00	N.W.b.W. 2	b c
October -	+1.9	13	16.0	30.50	S. 2	o s	29	-14.8	.15	Calm	b m
November	-7.6	11	+10.7	29.65	N.E.b.N. 4	o m	18	19.1	.59	S.E.b.E. 1	b
December	-14.8	15	-2.5	30.02	N.W.b.N. 3	b c	1	28.9	.36	N.W.b.W. 4	b m
January	-17.0	6	-0.8	29.67	W. b. S. 2	o m s	17	27.2	.10	N. b. E. 1	b
February	-29.6	1	-11.7	29.26	W. 2	c o, b m	22	41.0	30.52	W.N.W. 1	b
March -	-16.9	20	+3.5	30.06	S.E.b.S. 7	m	5	37.9	29.75	N.W. 2	b m
April -	+8.0	24	27.0	30.22	S. b. W. 1	o m s	1	-6.3	30.03	N.N.W. 3	b m
May -	+20.2	21	+28.7	30.09	N.E.b.E. 1	o s	3	+9.3	30.60	N. 3	b c



TABLE IV.

SUMMARIES OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), observed during the DRIFT of the "ADVANCE," 1850-1.

Months.	Total Observations.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O. F.		O. F.		O. F.		O. F.		O. F.		O. F.		O. F.		O. F.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
September 1850.	30	3	2.7	1	3.0	1	4.0	1	3.0	1	2.0	—	—	1	3.0	2	5.0
October	31	11	3.0	5	2.4	2	3.0	—	—	2	1.0	—	—	—	—	—	—
November	30	4	2.8	3	4.0	—	—	1	4.0	2	2.0	4	4.5	5	5.0	2	3.0
December	31	2	4.0	—	—	1	2.0	2	4.0	1	4.0	1	3.0	—	—	—	—
January 1851.	31	1	1.0	—	—	1	2.0	—	—	—	—	—	—	1	1.0	—	—
February	28	—	—	1	3.0	1	1.0	2	3.0	2	2.0	3	1.7	1	1.0	—	—
March	31	2	2.5	2	2.5	—	—	—	—	1	5.0	1	2.0	2	4.5	2	3.5
April	30	2	2.0	2	1.5	—	—	—	—	—	—	1	4.0	4	2.8	2	3.0
May	31	2	3.0	2	3.0	2	1.5	1	1.0	—	—	—	—	1	4.0	—	—

(continued.)

Months.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		Calms.		
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.			
September 1850.	-	-	3	3.7	2	3.0	3	2.7	1	2.0	2	2.5	1	3.0	3	4.7	3	2.0	2	1.5	-
October	-	-	2	3.5	1	4.0	1	1.0	1	3.0	-	-	-	-	2	3.5	2	2.5	-	-	2
November	-	-	-	-	-	-	-	-	-	1	1.0	2	2.0	3	1.7	2	4.0	-	-	-	1
December	-	-	-	-	2	1.	2	2.0	4	2.5	4	3.2	3	3.0	3	4.0	1	3.0	2	1.0	3
January 1851.	-	-	-	-	-	-	-	-	3	1.3	9	3.3	8	3.8	5	3.8	2	2.0	-	-	1
February	-	-	-	-	1	1.0	1	2.0	1	1.0	4	1.5	4	2.0	3	2.7	1	2.0	3	1.0	-
March	-	-	2	2.5	1	3.0	1	3.0	1	2.0	2	2.5	2	4.0	7	2.6	4	4.0	-	-	1
April	-	-	2	2.0	4	2.0	1	3.0	1	2.0	1	3.0	1	2.0	1	3.0	4	2.8	2	2.0	2
May	-	-	1	3.0	-	-	3	3.0	2	1.5	1	2.0	3	4.7	5	4.2	4	3.5	3	2.0	1

TABLE V.

SUMMARY OF WEATHER NOTATIONS, during the DRIFT of the "ADVANCE," 1850-1.

Month.	b.	c.	o.	m.	f.	r.	s.	q.
September 1850	1	13	16	—	8	—	12	—
October	8	14	9	13	1	—	8	—
November	8	13	9	20	—	—	3	—
December	10	21	—	27	—	—	—	—
January 1851	10	17	4	27	—	—	2	—
February	10	13	5	22	—	—	—	—
March	12	15	4	28	—	—	1	—
April	8	11	11	21	—	—	4	—
May	5	18	8	8	2	—	10	—

REMARKS during the DRIFT of the "ADVANCE."

1850.—SEPTEMBER.

- 12th, Midnight - Feeble aurora.
- 15th - Feeble aurora.
- 23rd - Ice piling up and giving us heavy rips.

OCTOBER.

- 17th, 1 a.m. - Faint aurora to the southward.
- 21st - Faint aurora S.W.
- 22nd - Faint aurora.
- 26th - Very faint aurora.
- 27th - Bistre-coloured auroral segment, 20° E. of magnetic axis.
- 29th - Faint nebulous aurora.
- 31st, 1 a.m. - Observed a small aurora to the S.W.

NOVEMBER.

- 2nd - Ice 3 feet thick.
- 3rd, 10 to 12 a.m. - Two parhelia.
- 8th, 5 a.m. - Aurora to the southward and westward.
- 11th - Ice much broken near the vessel.

DECEMBER.

- 1st, 4 p.m. - A bright aurora, in the form of a band, extending from the zenith to the horizon in a N.W. and S.E. direction. The aurora reappeared at 9.10 p.m., but lasted only 15 minutes.
- 3rd - Faint aurora visible for a short time.
- 5th - A transit aurora, ending with luminous bands to the S.E.
- 6th, 4 a.m. - Faint aurora to the W.



- 7th - Ice in an uproar.  
 8th, 3 a.m. - Faint aurora to the southward and eastward; 10 a.m., another to the N.W. Ice squeezing up.  
 11th, 4 a.m. - An aurora to the southward.  
 14th, 3 p.m. - A paraselene visible for an hour.  
 17th - Two paraselenæ.  
 18th - A paraselene.  
 20th - Two very brilliant paraselenæ, circle almost entire.  
 21st - A halo round the moon. The finest print may be read with facility at noon by turning it toward the south.  
 22nd - Ice squeezing and piling up.  
 26th - Two paraselenæ. At noon, faint aurora to the southward. An aurora in form of a bow passing through the zenith in a N.W. and S.E. direction. 11 p.m., paraselene visible.  
 27th, 5 a.m. - An aurora visible. At 6 a.m. another one. 10 p.m., an aurora passing through the zenith, in a N. and S. direction.  
 28th, 1 and 8 a.m. - Aurora visible; one passing  $30^\circ$  from the zenith, in form of an arch, to the westward.  
 29th, 4 a.m. - An aurora passing near the zenith in an E. and W. direction.  
 31st, 10 p.m. - Aurora visible; one appeared in the form of an arch extending to the horizon in N.N.E. and S.W. direction, passing  $15^\circ$  from the zenith.

## JANUARY.

- 1st, 11 p.m. - A faint aurora to the S.  
 2nd, 1 a.m. - An aurora passing near the zenith in an E. and W. direction. 7 a.m., two auroræ visible one passing through the zenith in an E. and W. direction, the other in faint beams radiating from the S.  
 3rd, 4 a.m. - An aurora to the S.  
 4th, 5 a.m. - An aurora to the S. and W.  
 11th, 3 a.m. - A paraselene, very bright.  
 13th - Ice much broken about the vessel.  
 15th, 3 a.m. - A faint aurora to the S.  
 19th, 11 p.m. - Paraselenæ.  
 20th, 6 a.m. - Paraselenæ.  
 21st, 5 a.m. and 8 p.m. - Paraselenæ.  
 23rd, 10 p.m. - Faint aurora.  
 26th, 9 p.m. - Aurora to the N.  
 27th, 2 and 8 a.m. - Aurora to S. and W. near the horizon.  
 29th, 6 a.m. - Faint aurora near the horizon.  
 29th, Noon - One third of the sun's disk visible from the deck.  
 29th, 11 p.m. - Faint aurora near the horizon to the S.W. and N.

## FEBRUARY.

- 2nd, 1 a.m. - Aurora to the S. and E., beams of light covering the whole of the eastern half of the heavens, most of them parallel to the plane of the meridian. Aurora extending to within  $30^\circ$  of the horizon to the N.W.  
 2nd, 7 p.m. - Aurora, beams radiating from the zenith.  
 5th - Faint aurora to S. and E.  
 6th, 7 a.m. - Faint aurora to the S., near the horizon. The thermometer used stood at  $39^\circ$ , when the mercury in the artificial horizon was freezing.  
 7th, 2 a.m. - Faint aurora to N.N.E. and S.S.W.

- 7th, 7 a.m. - Aurora to the S.E. and E.  
 Ice formed since 13th January was 27 inches thick.  
 8th, 5 p.m. - Bright paraselene.  
 13th - Three icebergs in sight.  
 13th, 7 p.m. - Faint aurora visible to the S.  
 16th - Two icebergs in sight to the E.  
 19th, 5 a.m. - An aurora visible passing near the zenith in a N.N.W. and S.S.E. direction. A parhelion having three images of the sun.  
 21st, 1 a.m. - Faint aurora to E.  
 21st, 4 p.m. - Aurora passing through the zenith and extending to the horizon in a N.W. and S.E. direction.  
 24th, 6 a.m. - Faint aurora about the zenith in a S. and W. direction.  
 25th, 3 p.m. - Faint aurora visible passing through the zenith in a N.W. and S.E. direction.  
 25th, 10 p.m. - Several auroræ to the N. and W.  
 26th, 1 a.m. - Aurora to S. and E.  
 26th, 9 p.m. - Several auroræ in different parts of the heavens.  
 27th, 3 a.m. - Aurora passing through the zenith in an E. and W. direction.

## MARCH.

- 1st - Ice found to be 3 feet thick.  
 3rd - Could feel ice through a hole cut to the depth of 11 feet.  
 8th, 11 a.m. - A parhelion.  
 9th, 1 a.m. - Faint aurora to S. and E.  
 13th, 1 a.m. - Bright paraselene visible for an hour.  
 13th, Noon - Bright parhelion; atmosphere filled with minute particles of snow.  
 14th - Faint parhelion.  
 19th - Opening in the ice 100 yards wide, extending from N.W. to S.E.  
 20th - A heavy bank of vapour in the S.  
 23rd, 1 a.m. - Aurora passed through the zenith to the N. and W.  
 23rd, 8 p.m. - A parhelion.  
 23rd, 9 p.m. - Faint aurora to N. and W.  
 24th, 1 a.m. - Aurora passing near the zenith from N. to S.  
 24th, 7 a.m. - A parhelion; at noon with two circles.  
 24th, 10 p.m. - Aurora to the S.  
 25th, 1 a.m. - Faint aurora to the S. and E.  
 26th, 11 p.m. - Faint aurora to S. and E.  
 27th, 1 a.m. and 6 p.m. - Frost-smoke.  
 28th, 2 p.m. - Frost-smoke on the horizon. To the S.W., N., and E. dense masses of vapour are hanging, as if over water.  
 28th, 11 p.m. - Aurora to the E.  
 29th, 1 a.m. - Observed a long line of frost-smoke from masthead to the S.  
 30th 1 a.m. - Much frost-smoke seen to the S.E.

## APRIL.

- 1st - Observed a circle, except an arc cut off by the horizon, about the sun when his altitude was  $8^\circ 40'$ , its radius  $21^\circ 30'$ ; upon a line drawn horizontally through the sun were two luminous spots, while a third was seen vertically above it. At this last was the arc of a circle apparently of the same radius and tangent to it. From the sun and each of the spots in its circle descended columns of light dazzling to the eye. No prismatic colours were visible at the time although they were seen a short time before to the horizon.



- 1st, 7 p.m. - A bright parhelion.  
Cut a floe formed in September and found it 7 feet 2 inches thick.
- 2nd - - Mist about the horizon; when the sun had attained the altitude of  $4^{\circ} 51'$ , observed the following: a circle, except the arc intercepted by the horizon, having the luminous spots upon it, one on each side of the sun, and at the same distance with it from the horizon, the third vertically above, a faint appearance of an arc tangential to the last point. The luminous columns noticed yesterday were seen more dazzling, and towards the sun bordered with orange. Concentric with this circle, and outside of it, was another similar in its parts but much more faint, radius of inner circle measured from sun  $22^{\circ}$ ; outer circle,  $46^{\circ} 30'$ . At 7.30 the phenomena were more distinct, the outer circle being finely marked with the colours of the rainbow; the arc, tangent at the upper spot, was seen in it also, while in the opposite quarter of the heavens was the partial reflection of the brightest parts.
- 3rd - - An appearance in the sky similar and equal in its parts to that described yesterday, but not as bright.
- 6th, 1 a.m. - Faint and fleeting aurora visible to the S.E.
- 6th, 9 p.m. - An aurora to the S.
- 10th - - A crack opening extending about 1 mile N.W. and S.E.
- 12th - - Large pool of water to the S. Ice much broken up; openings in every direction.
- 25th - - Several openings in the ice.
- 28th - - No open water in sight.
- 30th - - Found the ice 5 feet 5 inches thick.

## MAY.

- 7th - - Water in sight in all directions.
- 26th - - Two parhelia.

## JUNE.

- 5th - - On this day occurred the great disruption of the ice. The floes immediately around us had remained in process of freezing since January 13th without disturbance. Heard the sea breaking on the ice to the Nd. Ice cracking and opening in all directions, making floes large and small, which were rising and falling as if acted on by a heavy sea.

## No. XXIII.

## Results of Meteorological Observations made at Walker Bay.

H.M.S. "ENTERPRISE," Captain, now Admiral Sir R. Collinson, K.C.B., wintered during 1851-2 in Walker Bay, in latitude  $71^{\circ} 35' N.$ , longitude  $117^{\circ} 39' W.$  Walker Bay is a deep indentation to the northward of Minto Inlet, Prince Albert's Land. Its only opening seaward is to the south-westward.

For the purposes of this discussion the ship's log, lent by the Hydrographic Office, the master's log, lent by the Record Office, a meteorological register and a private journal lent by Sir Richard Collinson, have all been consulted.

The private journal states that the variation of the compass was  $81^{\circ} 21' E.$  at Walker Bay, and adds, "We found our compasses totally useless with the ship's head at S., and very sluggish in their movements. The variation with her head W. was  $44^{\circ} 25' E.$ ; and with her head E.,  $120^{\circ} 31' E.$ ; that on shore being  $78^{\circ} 50' E.$ " On and after October 1st, the winds were logged "true." Those for September have been corrected for compass error, by allowing seven points easterly variation.

The ship was furnished with at least one marine and one mountain barometer. From November 11th till March 31st inclusive, the mountain barometer was used, the marine barometer only being registered occasionally at noon. From these noon observations it appears that the mountain barometer read higher than the marine in November .040, in December .026, in January and February .016, in March .018. These differences have been applied to the results from the mountain barometer to reduce them to the indications of the marine barometer as a standard of reference, except for November, to which .03 only has been applied, the marine barometer having been used for eleven days.

No information whatever regarding the description of these barometers, or of their degree of accuracy, can now be obtained. The results from them here given have been reduced to temperature  $32^{\circ} F.$ , on the supposition that they had wooden frames.

A large number of thermometers were supplied to the ship, as the following table shows. It gives what purports to have been the thermometrical comparisons, but there are extraordinary discrepancies and inconsistencies, which do not admit of explanation, as for instance, on December 26th the readings of Nos. 51 and 461 were  $-25^{\circ}$  and  $-12^{\circ}$ , respectively; but on January 7th, they were  $-19^{\circ}$  and  $-25^{\circ}$ .



THERMOMETRICAL COMPARISONS, H.M.S. "ENTERPRISE."

Date.	No. of Thermometer.																					
	62.	418.	420.	403.	424.	69.	432.	51.	405.	400.	71.	72.	461.	462.	463.	464.	465.	416.	417.	452.	456.	
1851.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oct. 9	—	—	—	—	—	—	—	34	—	—	—	—	—	—	—	—	—	34	35	34	33' 5	
Dec. 10	—	—48	Mercury freezing point.																			
" 24	— 1	— 2	0	+ 1	— 5	0	— 6	— 7	0	0	+ 3	+ 1	+ 3	+ 3	+ 3	+ 3	+ 3	—	—	—	—	
" 25	— 9	— 9	— 5	— 2	— 12	— 2	—	— 11	— 5	— 7	— 3	— 5	— 4	0	0	— 2	0	—	—	—	—	
" 26	— 10	— 10	— 8	— 5	— 15	— 7	—	— 15	— 10	— 12	— 8	— 10	— 5	— 5	— 5	— 6	— 6	—	—	—	—	
" 27	— 15	— 15	— 15	— 12	— 25	— 15	—	— 25	— 23	— 25	— 20	— 20	— 12	— 13	— 12	— 12	— 10	—	—	—	—	
" 31	— 28	— 28	— 25	— 23	— 37	— 27	—	— 40	— 32	— 35	—	—	— 25	— 24	— 24	— 28	— 27	—	—	—	—	
" 31	—	— 52	— 44	—	— 45' 5	—	—	— 63	— 40	—	—	—	—	—	—	— 47	—	—	—	—	—	
1852.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Jan. 6	—	—	— 22	—	— 21	— 22' 5	—	— 19	— 25	—	— 26	— 24' 5	— 26	— 25	— 25	— 25	— 25	—	—	—	—	
Feb. 7	—	— 25	—	—	—	—	—	—	— 19	— 15	—	—	—	—	—	—	—	—	—	—	—	

No. 418 was the "observatory thermometer."  
No. 51 appears to have been used as "deck thermometer."  
No. 62 appears to have been used on the ice.  
No. 424, "sea thermometer," was broken 1852, September 23rd.  
No. 400, "plain bulb" } were exposed to the sunshine on a tripod 3 feet from  
No. 405, "blackened bulb" } the ice. No. 400 was broken 1852, August 21st.  
Taking No. 418 as standard, at -48° it was 10° too low; and assuming that it was correct at 32°, this error proportioned along the scale, gives the corrections stated in the table below. The comparisons of No. 51 with the standard yield very irregular corrections between -8° and -63° of the scale. As they are evidently faulty, it will probably be best to use only those at these limits for which the corrections are about +8° and +21°·5 respectively. From these the intermediate corrections have been interpolated as stated in the table below. The private journal states: "December 10th, mercury froze, and afforded us an opportunity of correcting the scale of our thermometers, none of which agreed, and some were 20° in error." The line in the table marked \* contains the corrections deduced on board, and used in the register for some time, on the supposition that the freezing point of mercury was -39°·5 instead of -38°, as it is now known to be. The corrections for the other thermometers used have been determined in a similar manner. As there is no information regarding the errors of the thermometers at the melting point of ice, they must be considered correct at that part of the scale.

CORRECTIONS deduced from the THERMOMETRICAL COMPARISONS.

No. of Thermometer.	At -68°.	At -58°.	At -48°.	At -38°.	At -28°.	At -18°.	At -8°.	At +2°.	At +12°.	At +22°.	At +32°.
418	+12·5	+11·3	+10·0	+ 8·8	+ 7·5	+ 6·3	+5·0	+3·8	+2·5	+1·3	0·0
51	+23·0	+20·5	+18·0	+15·5	+13·0	+10·5	+8·0	+5·5	+3·0	+0·5	0·0
*	+21·0	+19·0	+17·0	+14·0	+12·0	+11·0	+8·0	+6·0	+3·0	+1·0	0·0
62	—	—	—	—	+ 7·5	+ 6·3	+5·0	+3·8	+2·5	+1·3	0·0
400	—	—	—	—	—	- 3·0	-2·4	-1·8	-1·2	-0·6	0·0
405	—	—	—	—	—	+ 1·0	+0·8	+0·6	+0·4	+0·2	0·0

Table I. contains the four-hourly values of barometrical pressure for each month and for the entire period. They show that the diurnal range of pressure was very small, on the whole not exceeding ·008 inch from the maximum at 2 a.m., to the minimum about noon. The highest mean monthly pressure was 30·164 in March, the lowest 29·756 in July; and the mean pressure for the year, or rather 354 days, was 29·948 inches, a fact indicating a relatively high pressure in this part of the Arctic regions.

Table II. gives the four-hourly values for each month and for the entire period of the mean temperature of the air as observed by the deck thermometer and corrected for approximate errors. They show the mean diurnal range of the temperature to have been very small during the six months, September to February, and only from 4° to 11° for the other six months. It was greatest in March, and least, almost nil, in December. August had a small range of temperature, but this was probably owing to greater part of the month having been passed out of harbour. March was the coldest month, -22°·6, July the warmest, 41°·3; hence the mean range was 63°·9. The mean temperature of the 354 days was 8°·5, which must be approximately the mean of the year.

Table III. exhibits the extremes of barometrical pressure, with the accompanying temperature, wind, and weather for each month. The greatest monthly range was in February, 2·09 inches; the least in June, 0·70 inch. The barometrical pressure reached the extraordinary height of 31·08 inches in December, and fell to 28·85 in February, showing an absolute range of 2·23 inches. If anything the winds were lighter and the weather clearer with the high than with the low pressures, though temperature seems unaffected. The private journal states: "A very remarkable feature is the height of the barometer on the three last days of November and the two first days of December."

Table IV. exhibits the highest and lowest temperatures of the air in each month, with the accompanying barometrical pressure, wind, and weather. The greatest monthly range of temperature was 59° in January, the least 24°, in June. The absolute maximum temperature was 61° in July, the absolute minimum, -45°, in December, giving an extreme range of 106°. The barometrical pressure was generally lower, the wind stronger, and the weather less clear with the high than with the low temperatures,—a result as regards the pressure not brought out by Table III. The winds with the high temperatures are all from the east side.

Table V. supplies the four-hourly sums of the wind components for each month, with their means.

Table VI. combines the wind components for the entire period, from which the four-hourly resultants of the winds have been computed. These show a clearly defined periodicity, the maximum of force occurring about midnight, the minimum about noon, while the direction veers from N. 32° E. at 4 p.m. to N. 41° E. at 4 a.m.; neglecting the direction at 8 a.m. which seems unduly large in azimuth.

Table VII. contains the monthly resultants of the winds, deduced from the mean components in Table V. The peculiar feature of these resultants seems to be their



N.Ely. direction in all months except June and July, when it is N.Wly., though in February it is N.; and December, when it is S.Wly., is the only month with southing. December is also the month of feeblest force, showing that even then the S.Wly. winds scarcely predominated. The mean strength of the resultant in October was about twelve times that in December.

Table VIII.—In this table the winds for each month are summarised under sixteen bearings, and their mean force given. It thus affords information regarding the distribution of the winds in azimuth. The prevalent winds were from N.E. or E.N.E. in all months except June and July, when they were from W.N.W., which is generally the most prevalent direction. The following estimate of the prevailing winds in days was drawn up by Sir Richard Collinson at the time:—

PREVAILING WINDS, in Days.

Month.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	V'ble.	Calm.
October 1851	4 $\frac{1}{4}$	7 $\frac{3}{4}$	9	1	1 $\frac{1}{4}$	3 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	4 $\frac{1}{2}$
November "	1	4 $\frac{1}{2}$	11 $\frac{1}{4}$	2	—	3 $\frac{1}{4}$	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	9
December "	2 $\frac{3}{4}$	2 $\frac{1}{2}$	4 $\frac{3}{4}$	2	2 $\frac{3}{4}$	2	1	4 $\frac{1}{4}$	1 $\frac{3}{4}$	8 $\frac{1}{4}$
January 1852	2 $\frac{3}{4}$	2 $\frac{3}{4}$	4 $\frac{1}{4}$	1	1 $\frac{1}{2}$	3 $\frac{1}{4}$	2 $\frac{1}{2}$	5	1	10 $\frac{1}{2}$
February "	3	3 $\frac{1}{4}$	2 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$	4 $\frac{1}{2}$	1 $\frac{1}{2}$	9 $\frac{1}{4}$
March "	1 $\frac{1}{2}$	4	2 $\frac{1}{2}$	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	2 $\frac{3}{4}$	3	1 $\frac{1}{4}$	16
April "	1 $\frac{3}{4}$	9	8 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{2}$	6
May "	1 $\frac{3}{4}$	6	6 $\frac{1}{4}$	1	1	—	3 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{2}$	9 $\frac{1}{4}$
June "	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{1}{2}$	1	2 $\frac{3}{4}$	5 $\frac{1}{4}$	5 $\frac{1}{2}$	3 $\frac{1}{4}$	6 $\frac{1}{4}$
July "	3 $\frac{1}{4}$	3 $\frac{1}{2}$	1	1 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	6 $\frac{1}{2}$	5 $\frac{1}{4}$	4 $\frac{1}{4}$	9 $\frac{1}{2}$

Wind force 8 and upwards was recorded in October 15 times, November 4, December 7, January 9, February 7, April 10, May 2, June 2, July 5. These may be taken as the number of four-hourly durations of gales in the respective months.

Table IX. Herein the notations of weather by the Beaufort scheme are classified. The clearest month was March, which was also the coldest; the most obscure was June, when there was also the most fog and precipitation. Fog occurs chiefly in the summer half of the year. Snow, including rain, occurred on 69 out of 354 days.

Character of the Clouds.—A record was kept of the names of the clouds during some portions of the year, which has been summarised as follows: When the sky was overcast, foggy, or misty, no entries were made in the cloud columns, consequently the statistical balance of the record is lost, and there is no use in attempting a classification for each hour of observation.

—	No. of Observations.	No Cloud.	Cr.	Cr.-c.	Cr.-s.	Cm.	Cm.-s.	Str.	Nm.
September	108	34	1	—	—	18	—	—	—
August	156	44	12	4	3	24	3	11	1

*Aurora*.—Some very brilliant displays of the aurora are noticed very briefly in the remarks. The private journal states: "Generally speaking, the appearance of this beautiful phenomenon here was in the shape of light fleecy clouds, instead of the brilliant streak which was the distinguishing feature at Port Clarence. With us it sometimes shot up from all quarters of the compass to the zenith, forming a most magnificent canopy through which the stars, however bright, might be seen. I can only compare it to an enormous tent, the curtains of which were continually in motion, and as constantly changing their brilliancy. On one or two occasions the brightness took a reddish tinge, forming one of the most beautiful shades of colour I have ever seen. Occasionally it appeared quite close to us, and the rapidity with which the intensity of light passed from one portion to another was wonderful, but I have never heard, nor did I hear, that any other person had detected a noise accompanying it."

*Temperature of the Sea*.—The results of observations on the temperature of the surface of the sea are as follows:—

MONTH.	4 a.m.	8 a.m.	Noon.	4 p.m.	8 p.m.	Midnight.	Mean.
1851, September 13th to 30th	33°·2	33°·9	34°·1	34°·2	33°·8	33°·3	33°·7
1852, August 6th to 31st	32°·5	33°·0	33°·9	34°·7	33°·4	32°·7	33°·4

1851, October - The temperature of the sea-surface in the day was 30°, from four observations; and at a depth of 10 fathoms, 31°·5 from two observations.

1852, July 28th Temperature of sea water 34°·5.

The distinguishing number of the thermometer used not having been recorded, no correction can be applied to these observations.

## THICKNESS OF ICE.

Date.	Thickness.
y. mo. d.	
1851 10 1	Ice forming over the bay.
" " 8	Bay partially covered with bay ice.
" " 9	Bay covered with young ice.
" " 13	Ice drifted out of bay.
" " 17	Bay ice making.
" " 18	Ice drifted out of bay.
	ft. ins.
" " 19	0 2
" " 11 1	0 6
" " 12 23	2 10 Depth of water 15 fathoms.
1852 2 2	4 4 " 13 "
" 3 1	5 5
" 4 1	5 7 $\frac{1}{2}$
" 5 1	5 3
" 6 1	5 1
" 7 1	4 10
" " 16	3 4 $\frac{1}{2}$
" " 31	Loose ice setting out of bay



*Temperature at Observatory.*—Occasional observations are recorded from a thermometer marked “Observatory,” presumed to have been on shore at the building erected for magnetical observations. These observations compared with the simultaneous readings of the deck thermometer, after allowing for errors of instruments, yield the following results: At the observatory the air was colder than on deck, during December 2°·9 from 15 observations, during January 2°·8 from 23 observations, during February 1°·1 from 28 observations, and during March 0°·9 from 21 observations. During April the observations appear to have been taken on the ice, not at the observatory, and as the instrument may have been changed as well as the position, there can be no certainty in dealing with them; however, the mean of 16 observations show a higher temperature by 0°·3 than at the ship.

*Solar Radiation.*—The effect of solar radiation was noticed on two thermometers, one with bulb bright, the other with bulb blackened, and the following mean results have been deduced from the observations:—

Month.	No. of Observations.	Shade.	Sunshine.	
			Bright Bulb.	Black Bulb.
1852, February	8	—18·4	—2·2	+1·1
„ March	32	—19·5	+14·7	+19·4
„ April	20	+15·7	+40·0	+44·6
„ May	19	+21·8	+47·6	+52·4

*Game List.*—The material for the game list was readily furnished by the private journal, and as it will probably have some interest in connexion with the weather, it is here reproduced:—

GAME BROUGHT ON BOARD.

MONTH.	Bears.	Deer.	Hares.	Foxes.	Seals.	Small Birds.	Ptarmi-gan.	Gulls.	Ducks.	Geese.	Divers.	Cranes.	Fish.
1851.													
Sept. 15th to 30th.	3	—	26	—	—	—	3	11	—	—	—	—	—
Oct. - - -	—	—	17	2	—	—	25	—	—	—	—	—	—
Nov. - - -	—	—	5	3	—	—	—	—	—	—	—	1	—
Dec. - - -	—	—	—	13	—	—	—	—	—	—	—	—	—
1852.													
Jan. - - -	—	—	13	2	—	—	15	—	—	—	—	—	—
Feb. - - -	—	—	11	2	—	—	5	—	—	—	—	—	—
Mar. - - -	—	—	22	—	—	—	8	—	—	—	—	—	—
April - - -	—	—	—	—	—	—	—	—	—	—	—	—	—
May - - -	1	1	5	—	—	1	1	—	—	—	—	—	—
June - - -	—	1	10	—	—	10	25	—	—	—	—	—	—
July - - -	—	3	9	—	—	—	34	21	184	44	12	8	—
Aug. 1st to 12th.	—	—	—	—	3	—	2	—	48	3	—	—	—
332 days -	4	5	127	22	3	11	118	32	232	47	12	9	1153

TABLE I.  
MEAN BAROMETRICAL PRESSURE, at WALKER BAY, 1851 September 13th, to 1852 August 31st.

Hours.	1851.				1852.								Year.
	(18 days) Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	
4 a.m. -	29·936	29·869	30·080	30·127	29·922	29·831	30·177	30·043	30·009	29·815	29·744	29·862	29·951
8 „ -	·931	·860	·067	·113	·902	·836	·176	·023	·011	·817	·751	·854	·945
Noon -	·922	·866	·086	·110	·894	·843	·164	·015	·008	·812	·755	·851	·944
4 p.m. -	·922	·855	·100	·116	·907	·858	·159	·025	·005	·817	·760	·854	·948
8 „ -	·940	·856	·101	·103	·898	·873	·154	·025	·007	·812	·755	·848	·948
Midnight -	·944	·871	·107	·104	·886	·881	·153	·029	·002	·819	·769	·845	·951
Means -	29·932	29·863	30·090	30·112	29·902	29·854	30·164	30·027	30·005	29·815	29·756	29·852	29·948

TABLE II.  
MEAN TEMPERATURE OF THE AIR, at WALKER BAY, 1851 September 13th, to 1852 August 31st.

Hours.	1851.				1852.								Year.
	(18 days) Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	
4 a.m. -	29·5	13·3	—5·4	—17·0	—19·2	—17·0	—26·8	4·8	9·4	29·3	37·9	35·4	5·9
8 „ -	30·4	13·8	—4·1	—17·2	—18·7	—16·2	—26·0	8·0	13·8	32·4	40·2	36·9	7·8
Noon -	31·5	15·7	—4·1	—16·7	—16·8	—14·5	—17·0	14·3	21·3	34·5	43·9	39·0	10·9
4 p.m. -	31·6	15·7	—5·5	—16·8	—17·3	—15·2	—15·8	15·4	23·2	34·8	43·7	38·8	11·0
8 „ -	30·0	13·8	—6·1	—16·7	—18·1	—17·0	—23·6	10·2	17·8	33·6	42·7	37·5	8·7
Midnight -	28·3	12·5	—5·1	—16·8	—18·6	—17·6	—26·4	6·6	10·2	30·4	39·3	35·3	6·5
Means -	30·2	14·1	—5·0	—16·9	—18·1	—16·3	—22·6	9·9	16·0	32·5	41·3	37·1	8·5



TABLE III.

EXTREMES OF ATMOSPHERIC PRESSURE, with accompanying TEMPERATURE, WIND, and WEATHER, at WALKER BAY, 1851 September 13th, to 1852 August 31st.

Month.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Weather.	Range.
September 1851	d. h. 16 4	inches. 30.28	+29	N.b.W. 3	b c	d. h. 25 12	inches. 29.38	+32	E. b. N. 1	o c	inches. 0.90
October "	" 23 16	" 23	-11	N.E. 1	"	" 10 8	" 26	+25	N.E. 8	o q s	0.97
November "	" 28 8	" 87	-28.5	Calm	b	" 21 0	" 53	-12	E. 4	o	1.34
December "	" 1 20	31.08	-17	"	b c	" 25 20	" 57	-21	N.W. 1	o c	1.51
January 1852	15 16	30.68	-28.5	N. 2	b	31 12	" 09	+12	E.N.E. 4	o q	1.59
February "	" 29 12	" 94	-6	E.N.E. 8	b q	" 1 4	28.85	+7.5	Calm	o s	2.09
March "	" 1 4	31.03	-5	Calm	b	" 5 8	29.57	-5	N.W. 2	"	1.46
April "	" 19 8	30.41	+25	"	o c	" 13 12	" 51	+17	V'ble. 1	"	0.90
May "	" 20 16	" 29	+2	"	b c	" 3 20	" 42	+14	Calm	o c	0.87
June "	" 6 16	" 16	+3	E.N.E. 3	o s	" 30 8	" 46	+35	N. 8	c s q	0.70
July "	" 22 16	" 08	+36	W. 1	o c	" 18 8	" 37	+35	W.N.W. 1	o r	0.71
August "	" 2 4	" 24	+42	W.S.W. 4	b c	" 18 20	" 42	+34	N.W. 2	b c	0.82
Year -	Dec.	31.08	—	—	—	Feb.	28.85	—	—	—	2.23

TABLE IV.

EXTREMES OF AIR TEMPERATURE, with accompanying PRESSURE, WIND, and WEATHER, at WALKER BAY, 1851 September 13th, to 1852 August 31st.

Month.	Date.	Max.	Bar.	Wind.	Weather.	Date.	Min.	Bar.	Wind.	Weather.	Range.	Mercury frozen.
September 1851	d. h. 14 8	45	inches. 29.77	E. b. N. 4	o c d	d. h. 28 16	+12	30.02	E. b. N. 3	b	33	days.
October "	" 14 0	32	" 68	E.N.E. 4	o s	" 23 16	-11	" 23	N.E. 1	b c	43	—
November "	" 19 12	12	" 98	Calm	o c	" 30 8	-31	" 81	Calm	b	43	—
December "	" 15 16	9	30.02	E. 4	b c q	" 8 20	-45	" 20	"	"	54	3 1/4
January 1852	31 8	18	29.17	E.N.E. 3	o s	" 25 0	-41	29.88	"	"	59	3 1/4
February "	" 0 20	10.5	28.88	" 4	o q	" 11 16	-39	30.01	"	b c	49.5	1/4
March -	" 31 0	4	30.33	S.E. 3	b c	" 10 20	-43	" 01	"	b	47	3 1/4
April "	" 20 4	28	" 26	S. 1	o c	" 4 16	-20	" 32	"	"	48	—
May "	" 17 4	43	29.96	Calm	b c	" 10 20	-3	" 18	"	b c	46	—
June "	" 16 0	43	" 73	"	b	" 0 16	+19	29.86	"	o s	24	—
July "	" 26 0	61	" 86	"	b c	" 16 16	+32	" 75	W. 4	o c q	29	—
August "	" 10 0	58	" 69	N.N.E. 4	b c q	" 29 16	+25	30.03	S.E. 1	b	33	—
Year -	July	61	—	—	—	Dec.	-45	—	—	—	106	11

TABLE V.

SUMS OF WIND COMPONENTS, at WALKER BAY, 1851 September 13th, to 1852 August 31st.

Hours.	18 days—September 1851.				October 1851.				November 1851.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	15.1	9.0	17.4	3.2	40.5	5.4	59.0	0.7	7.5	6.7	43.1	8.4
8 "	20.7	5.1	17.9	2.4	37.6	4.6	57.5	2.2	18.1	10.9	56.6	3.5
Noon	22.2	2.2	13.7	12.0	29.1	6.9	58.2	3.9	23.8	3.9	53.1	3.4
4 p.m.	31.4	4.3	20.2	5.8	47.7	2.3	65.7	9.3	17.7	6.5	49.4	1.4
8 "	27.0	0.8	21.4	3.5	55.2	2.1	55.7	3.3	24.6	5.4	48.3	—
Midnight	32.4	1.1	17.6	2.7	60.1	3.7	62.1	6.4	12.8	9.8	55.8	—
Means	24.8	3.8	18.0	4.9	45.0	4.2	59.7	4.3	17.4	7.2	51.0	2.8

Hours.	December 1851.				January 1852.				February 1852.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	20.1	14.5	18.3	16.2	27.1	2.1	12.0	16.7	29.1	6.3	22.0	20.3
8 "	27.8	19.2	17.1	24.4	28.6	10.5	17.5	22.6	32.2	7.8	12.9	28.0
Noon	18.1	26.4	12.1	21.4	26.0	9.8	26.3	21.6	31.8	5.7	15.0	20.2
4 p.m.	19.3	24.9	11.7	16.5	25.3	19.2	29.5	12.1	24.7	2.9	11.5	22.2
8 "	11.2	26.8	16.8	23.5	22.1	16.7	21.9	22.2	33.3	3.9	24.2	8.1
Midnight	15.8	22.0	25.0	27.4	27.5	9.9	25.7	19.6	39.0	7.4	23.6	13.5
Means	18.7	22.3	16.8	21.6	26.1	11.4	22.1	19.1	31.7	5.7	18.2	18.7

Hours.	March 1852.				April 1852.				May 1852.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	18.0	1.0	16.4	10.7	22.4	1.0	51.5	0.7	26.2	2.4	28.5	6.8
8 "	14.2	3.8	14.5	9.3	24.6	4.2	54.7	1.8	17.2	1.8	22.6	5.2
Noon	15.1	2.1	19.4	7.8	22.8	9.0	55.7	1.4	18.4	1.9	21.1	3.0
4 p.m.	11.9	5.8	17.6	12.7	25.6	12.7	56.0	6.5	21.1	3.9	31.5	5.7
8 "	15.0	4.2	16.6	8.9	33.3	6.1	55.0	3.4	27.8	4.7	31.0	4.3
Midnight	8.8	3.0	18.3	6.9	31.2	4.4	52.4	1.3	24.4	3.0	25.1	3.3
Means	13.8	3.3	17.1	9.4	26.6	6.2	54.2	2.5	22.5	3.0	26.6	4.5

Hours.	June 1852.				July 1852.				August 1852.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	25.4	8.5	16.5	26.1	29.9	2.6	19.7	16.8	12.8	8.4	20.0	20.4
8 "	15.3	9.5	15.0	16.5	28.2	3.3	18.0	16.7	20.0	9.6	21.7	24.2
Noon	21.9	11.8	13.3	31.8	32.0	5.4	20.9	28.7	22.1	17.3	23.2	23.3
4 p.m.	22.0	7.7	8.0	43.9	39.2	7.1	13.1	39.5	24.1	13.5	23.0	37.4
8 "	21.7	12.0	15.6	29.7	21.4	2.7	9.9	33.0	20.8	10.2	36.8	16.7
Midnight	27.6	10.4	21.8	22.3	31.5	5.5	15.9	34.6	32.8	6.6	29.3	8.3
Means	22.3	10.0	15.4	28.4	30.4	4.4	16.2	28.2	22.1	10.9	25.7	21.7



TABLE VI.

SUMS OF WIND COMPONENTS, with RESULTANT WINDS, at WALKER BAY, for the Period 1851 September 13th, to 1852 August 31st.

Hours.	Components.				Resultants.	
	N.	S.	E.	W.	Direction.	Force.*
4 a.m. -	274.1	67.9	324.4	147.0	N. 41° E.	272
8 " -	284.5	90.3	326.0	156.8	N. 41 E.	257
Noon -	283.3	102.4	332.0	178.5	N. 40 E.	236
4 p.m. -	310.0	110.8	337.2	213.0	N. 32 E.	235
8 " -	313.4	95.6	355.2	156.6	N. 42 E.	294
Midnight	343.9	86.8	372.6	146.3	N. 41 E.	340
Means -	301.5	92.3	341.2	166.3	N. 40 E.	273

\* These figures must be divided by 354, the number of days, to obtain the mean force (Beaufort's scale).

TABLE VII.

MONTHLY RESULTANTS OF THE WINDS, at WALKER BAY, 1851 September 13th, to 1852 August 31st.

Month.	Resultants.	
	Direction.	Force.*
September 1851 -	N. 32 E.	1.38
October " -	N. 54 E.	2.23
November " -	N. 78 E.	1.63
December " -	S. 53 W.	0.19
January 1852 -	N. 12 E.	0.48
February " -	N. 1 W.	0.90
March " -	N. 36 E.	0.42
April " -	N. 68 E.	1.87
May " -	N. 49 E.	0.95
June " -	N. 47 W.	0.60
July " -	N. 25 W.	0.93
August " -	N. 20 E.	0.39

\* In grades of Beaufort's scale.

TABLE VIII.

SUMMARY OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), WALKER BAY.

Months.	Total Observations.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
September 1851. -	108	21	3.0	9	2.4	6	2.2	15	3.0	13	2.5	3	3.7	2	2.5	2	2.0
October -	186	27	2.4	7	3.6	38	4.5	30	4.4	28	3.5	—	—	5	1.6	2	3.0
November -	180	5	3.2	4	3.7	15	2.1	26	5.2	41	2.4	10	3.2	12	3.2	—	—
December -	186	9	1.6	3	1.3	12	1.8	4	1.7	20	1.9	5	4.4	8	2.5	3	3.3
January 1852. -	186	6	3.3	3	8.0	16	1.4	12	2.5	12	3.2	4	5.2	8	3.7	2	6.0
February -	174	11	5.1	4	3.7	14	3.1	6	3.1	17	2.3	1	3.0	2	4.0	4	2.5
March -	186	3	1.3	2	1.0	19	2.1	9	3.8	12	2.1	1	4.0	5	3.4	—	—
April -	180	—	—	13	2.1	39	3.3	33	3.4	20	4.0	9	4.0	1	2.0	—	—
May -	186	8	1.6	7	3.3	29	2.5	28	2.2	15	1.7	1	2.0	5	2.2	4	1.2
June -	180	7	3.9	2	6.0	10	2.3	5	2.2	4	2.0	13	3.0	8	2.4	1	2.0
July -	186	13	2.7	8	5.2	12	3.7	6	3.3	4	2.0	2	4.5	4	1.0	3	4.3
August -	186	12	2.5	10	2.9	11	2.9	6	2.5	25	3.0	3	2.3	15	2.1	1	2.0

(continued.)

Month.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		No. of Calms.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
September 1851. -	1	2.0	—	—	—	—	2	3.0	4	3.0	2	1.5	3	1.7	11	2.5	—	—	14
October -	2	1.0	2	2.0	3	2.3	3	2.7	4	1.2	1	1.0	2	2.5	4	1.7	—	—	28
November -	—	—	—	—	1	2.0	1	5.0	1	2.0	—	—	3	4.0	—	—	—	—	61
December -	12	4.2	7	4.4	9	3.3	3	2.3	4	4.5	3	3.7	17	4.0	10	2.8	—	—	57
January 1852. -	6	3.0	—	—	2	7.5	6	1.7	8	1.7	10	3.2	18	3.7	5	4.0	2	1.5	66
February -	3	2.3	1	3.0	3	2.3	3	2.7	12	2.4	6	3.5	19	2.7	7	5.4	—	—	61
March -	4	1.2	—	—	1	1.0	1	2.0	8	1.4	7	2.6	13	2.7	2	2.0	—	—	99
April -	7	2.1	1	1.0	8	1.1	—	—	2	2.0	2	1.0	1	1.0	3	1.7	2	1.5	39
May -	4	1.0	—	—	1	1.0	—	—	9	1.6	2	1.0	3	3.3	7	3.0	2	1.0	61
June -	5	2.0	1	2.0	10	1.7	8	2.0	18	2.0	20	3.2	19	3.4	2	2.0	1	2.0	46
July -	—	—	3	1.5	—	—	4	2.5	28	2.6	16	2.4	22	3.0	4	1.7	—	—	57
August -	4	2.2	3	3.0	10	2.0	6	3.5	17	3.0	4	2.7	14	2.7	4	3.2	3	1.1	38



TABLE IX.

SUMMARY OF WEATHER NOTATIONS, at WALKER BAY, 1851 September 13th, to 1852 August 31st.

Hours.	(18 days) September 1851.								October 1851.								November 1851.								
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	
4 a.m.	4	7	7	—	—	—	4	3	14	9	8	—	—	—	8	2	9	9	12	—	1	—	—	5	2
8 "	5	7	6	1	—	—	3	1	15	8	8	—	—	—	8	3	7	12	11	—	—	—	—	5	2
Noon	5	9	4	1	—	1	2	1	13	9	9	—	—	—	8	3	8	11	11	—	—	—	—	7	3
4 p.m.	4	10	4	2	1	1	1	1	11	11	9	—	—	—	3	6	7	10	13	—	1	—	—	6	4
8 "	5	7	6	—	—	2	1	1	11	13	7	—	—	—	3	6	9	9	12	—	1	—	—	4	4
Mdn.	7	6	5	—	—	1	1	1	12	11	8	1	—	—	4	6	10	8	12	—	1	—	—	1	4
Means	5.0	7.7	5.3	0.7	0.2	0.8	2.0	1.3	12.7	10.2	8.1	0.2	—	—	5.7	4.3	8.3	9.8	11.9	—	0.7	—	—	4.7	3.2
—	December 1851.								January 1852.								February 1852.								
4 a.m.	17	8	6	2	—	—	1	5	17	7	7	1	—	—	4	4	12	6	11	1	—	—	—	4	5
8 "	17	8	6	2	—	—	1	5	16	8	7	1	—	—	3	5	8	8	13	—	—	—	—	4	4
Noon	15	10	6	2	—	—	1	7	11	10	10	1	—	—	1	6	7	12	10	—	—	—	—	3	3
4 p.m.	12	9	10	2	—	—	5	9	11	12	8	1	—	—	2	4	8	9	12	—	—	—	—	3	2
8 "	15	7	9	1	—	—	3	5	17	7	7	—	—	—	5	3	12	9	8	2	—	—	—	2	3
Mdn.	14	8	9	1	—	—	4	8	15	8	8	1	—	—	6	5	14	8	7	2	—	—	—	4	4
Means	15.0	8.3	7.7	1.7	—	—	2.5	6.5	14.5	8.7	7.8	0.8	—	—	3.5	4.5	10.2	8.7	10.1	0.8	—	—	—	3.3	3.5
—	March 1852.								April 1852.								May 1852.								
4 a.m.	21	4	6	2	—	—	5	4	8	13	9	3	—	—	2	3	9	13	9	—	2	—	—	2	1
8 "	22	5	4	1	—	—	2	1	10	13	7	2	—	—	1	4	9	13	9	—	2	—	—	1	2
Noon	20	7	4	2	—	—	2	—	9	14	7	4	—	—	1	2	10	13	8	—	1	—	—	2	1
4 p.m.	21	6	4	3	—	—	2	2	10	13	7	—	—	—	3	11	13	7	—	—	—	—	3	—	
8 "	23	5	3	1	—	—	2	2	8	13	9	—	—	—	1	5	9	13	9	—	—	—	—	3	1
Mdn.	24	4	3	1	—	—	1	3	8	11	11	1	—	—	5	7	9	13	9	—	—	—	—	3	2
Means	21.8	5.2	4.0	1.7	—	—	2.3	2.0	8.8	12.9	8.3	1.7	—	—	1.7	4.0	9.5	13.0	8.5	—	0.8	—	—	2.3	1.2
—	June 1852.								July 1852.								August 1852.								
4 a.m.	2	9	19	—	2	—	11	7	2	15	14	—	1	5	3	5	12	11	8	—	2	1	—	—	2
8 "	3	11	16	—	3	1	3	6	4	14	13	—	2	2	4	4	12	13	6	—	1	1	—	—	2
Noon	7	12	11	1	1	1	2	4	8	17	6	—	—	—	—	4	12	13	6	—	2	—	—	—	2
4 p.m.	3	16	11	—	—	1	2	3	7	15	9	—	1	3	3	2	12	13	6	—	2	1	—	—	1
8 "	5	10	15	—	1	—	8	4	6	15	10	—	1	4	1	3	10	14	7	—	1	1	—	—	1
Mdn.	2	13	15	—	3	—	5	6	5	14	12	—	3	2	—	5	10	13	8	—	1	2	1	—	2
Means	3.7	11.8	14.5	0.2	1.7	0.5	5.2	5.0	5.3	15.0	10.7	—	1.3	2.7	1.8	3.8	11.3	12.8	6.9	—	1.5	1.0	0.2	—	1.7

NOTES AT WALKER BAY, H.M.S. "ENTERPRISE."

1851.—SEPTEMBER.

- 13th - - Lat. 71° 33' N., long. 118° 52' W.
- 14th - - " 71° 34' N., " 118° 24' W.
- 15th - - Anchored in Walker Bay.
- 17th, 4 a.m. - Aurora seen.
- 29th, 4 a.m. - Aurora very bright.

OCTOBER.

- 21st, Midnight - Bright aurora.

NOVEMBER.

- 15th - - Heavy snow-drift during an E.N.E. gale, reaching force 10 at noon.
- 20th, 2 a.m. - Aurora very bright.
- 26th, 2 a.m. - Bright aurora.
- 28th, 3 a.m. - Bright aurora.

DECEMBER.

- 3rd - - Heavy snow-drift, during a gale from S., reaching force 9 at noon.
- 9th, 3 a.m. - Aurora at intervals.
- 10th, 3 a.m. - Bright aurora.
- 16th, 4 a.m. - Bright aurora.
- 20th, 3 a.m. - Bright aurora.
- 21st, 4 a.m. - Bright aurora.
- 22nd, 10 p.m. - Bright aurora.
- 28th, 4 a.m. - Bright aurora.
- 29th, 4 a.m. - Bright aurora.
- 30th, 4 a.m. - Bright aurora.

1852.—JANUARY.

- 1st, 2 a.m. - Bright aurora.
- 19th, 9 p.m. - Bright aurora.
- 24th - - Sun seen from top of hill for first time since 18th November 1851.
- 25th, 9 p.m. - Bright aurora.
- 28th - - Saw two wolves.

FEBRUARY.

- 26th, 3 a.m. - Bright aurora.
- 28th, 10 p.m. - Bright aurora.

MARCH.

- 1st, 3 a.m. - Bright aurora.
- 13th, 11 p.m. - Bright aurora.
- 15th, 11 p.m. - Slight aurora.
- 16th - - Two ravens seen. 11 p.m., bright aurora.
- 17th, 2 a.m. - Bright aurora.
- 19th, 8 p.m. - Bright aurora.
- 20th, 2 a.m. - Bright aurora.
- 21st, 2 a.m. - Bright aurora.



APRIL.

5th - - Two wolves seen, and a wolf seen on 12th.  
14th - - A seal seen, and also on 24th.

MAY.

17th - - Two wolves seen.  
21st - - Three deer seen.  
25th - - Caught a fox.

JUNE.

2nd - - Several deer seen.  
6th - - Flocks of geese.

JULY.

31st - - Loose ice setting out of the bay.

AUGUST.

5th, 9.30 a.m. - Got underweigh. Loose ice.  
6th - - Lat. 71° 18' N., long. 118° 35' W. Loose ice.  
7th - - „ 71° 8', „ 118° 5'. A whale seen. Loose ice.  
8th - - Anchored in Fish Bay. Lat. of bay 71° 24' 13'', long. 117° 40' 45''.  
14th, 4 a.m. - Bay full of ice. 8 p.m., ice drifting out of the bay. 10.30 p.m., stood out of the bay.  
15th - - Lat. 71° 13', long. 119° 37'. Streams of loose ice.  
16th - - „ 71° 12', „ 119° 29'. Three whales seen. Loose, heavy ice.  
17th - - „ 71° 10', „ 119° 8'. A whale seen. Loose ice.  
18th - - „ 71° 8', „ 118° 42'. Two whales and a bear seen.  
19th - - „ 70° 58', „ 119° 1'. Sconces and loose ice.  
20th - - „ 71° 1', „ 118° 25'. Loose ice.  
21st - - „ 70° 45', „ 118° 56'. Three whales seen. Bay, young and loose ice.  
22nd - - „ 70° 49', „ 118° 50'. Beset.  
23rd - - „ 71° 3', „ 118° 51'. Close beset.  
24th - - „ 71° 17', „ 119° 42'. Seals numerous. Sconces and loose ice.  
25th - - „ 71° 19', „ 120° 39'. A whale seen. Immense quantity of ducks. Loose streams.  
26th - - „ 71° 18', „ 121° 3'. Several whales seen. Young ice.  
27th - - „ 71° 51', „ 119° 52'. Some deer seen. Floes of ice.  
28th - - „ 71° 25', „ 119° 32'. Loose sailing ice. Large flocks of geese flying to Sd.  
29th - - „ 71° 18', „ 118° 30'. Loose ice. Large flocks of geese flying to Sd.  
30th - - „ 71° 4', „ 118° 31'. Streams and loose heavy ice.  
31st - - „ 70° 46', „ 119° 0'. Four whales seen. A seal seen. Geese going S.

No. XXIV.

Results of Meteorological Observations made at Cambridge Bay.

H.M.S. "ENTERPRISE," Captain R. Collinson, C.B., which had passed the winter 1851-52 in Walker Bay, wintered during 1852-53 in Cambridge Bay, on the north side of Dease Strait, in latitude 69° 3' N., longitude 105° 12' W. Sir Richard Collinson's private journal states that "Cambridge Bay, or that part of Dease Strait between the Finlayson Islands and Cape Colborne, is 30 miles from east to west and 12 from north to south. The former are occasioned by a ridge of basalt running in a S.S.E. direction. They are all small, the largest being rather more than two miles long and three-quarters of a mile broad, rising towards the southern extremity in a long table hill 160 feet above the sea. The island at a distance appears like two. The northern summit has a lake on it, and does not rise so high as the southern." "Nine and a half miles from the largest Finlayson on the Victoria shore, is a long low sandy point, at the back of which several round peaks arise, the highest of which I have named Mount Augusta." "To the eastward of Mount Augusta, seven and a half miles, is Flagstaff Inlet, under which we passed the winter; a narrow channel navigable only for boats separates it from Victoria land." "Flagstaff Island is three-quarters of a mile long. On it are two hills, the northern being the higher about 90 feet." "Mount Pelly rises to the height of 800 feet, six miles inland from the north shore of the inlet, the intervening land being low limestone hills with lakes and tarns intervening. The eastern and southern faces of the mountain are very precipitous, and the summit a level plain. A large lake lies immediately to the west of it, and two ranges of hills nearly as high as Mount Pelly are near to its northern shore. With these exceptions the hills seldom rise to 300 feet above the sea."

In Dolphin and Union Strait and in Dease Strait the compasses were useless. The true direction of the winds was recorded throughout the winter.

The documents which have been consulted for data at Cambridge Bay are the ship's log, the master's log, and the captain's private journal. The instruments were the same as those employed at Walker Bay. (*Vide* pp. 375-6.)

Table I. contains the mean readings of the marine barometer reduced to 32°. They show on the whole, that the diurnal range of pressure was about .016 inch, from the maximum at 4 a.m. to the minimum at noon. The highest monthly mean was 30.056 inches in March, the lowest 29.675 in July, omitting that for the eight days of September, and the mean pressure for the 326 days was 29.870.



Table II. shows the mean temperature of the air observed by the deck thermometer and corrected for approximate errors. The mean diurnal range is very small for September to February inclusive. It was largest in April, 13°. The coldest month was January, -36°·2; the warmest July, 39°·8; so that the mean range was 76°. The mean temperature of the 326 days was +2°·5, which cannot be far from the mean for the year.

Table III. exhibits the highest and lowest extremes of barometrical pressure in each month with the temperature, wind, and weather at the time. The greatest monthly range was 1·27 inches in January, the least 0·59 in June. The absolute maximum was 30·61 inches in March, and the absolute minimum was 29·00 in September, giving a range of 1·61 inches. There does not seem to be any definite relation between the extremes of pressure and the condition of weather at Cambridge Bay.

Table IV. shows the absolute maximum and minimum temperatures of the air in each month, with the barometrical pressure, wind, and weather at the time. The greatest monthly range of temperature was 68° in March, the least (omitting September and August which are incomplete) 23° in July. The highest temperature of the period was 55°, in July; the lowest, -52°·5, in January; giving an extreme range of 107°·5. The highest temperature seems to be related to easterly winds. There is no instance of precipitation with the lowest temperatures, which seem to accompany clear weather.

Table V. supplies the four-hourly sums of the wind components for each month, and their means.

Table VI. combines the wind components for the entire period, together with their resultants. These indicate a periodicity having two maxima and two minima. The maxima of force occur about 4 a.m. and midnight, the direction is then N. 17° W.; the minima at 8 a.m. and p.m., and the direction veers to N. 25° W.

Table VII. contains the monthly resultants of the winds computed from the mean components in Table V. They are all in the N.W. quadrant, excepting those for March, April, and October, which are in the N.E. quadrant, and that for November, which is in the S.E. quadrant. November and March have the least resultant force, 0·4; and October has the greatest, 1·5. The resultant wind for the whole period is about N.N.W., force 0·8.

Table VIII. summarises the winds of each month under sixteen points of the compass, and gives the mean force under each direction. During the last eight days of September the winds were very strong, from the N.W. chiefly. The most frequent wind in October was N.E., in January W., in February N.W., in March S.E., in May N.W., in August W. November had frequent S.E., and about equally frequent and strong N.W. winds. December had most wind from N.E. and W.N.W.; April and June from N.W. and N.E.; July from W. and N.E. Calms were most prevalent in January, February, and March.

The following summary was drawn up by Sir R. Collinson at the time :—

PREVAILING WINDS, at CAMBRIDGE BAY, in DAYS.

Months.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Variable.	Calm.
1852.										
October -	4½	10	3½	1¾	1¼	1¼	¾	4	½	3½
November -	¾	3½	¾	6½	1¾	2½	3	5¼	¼	¾
December -	2½	6½	½	2¼	¾	¾	8½	6½	—	2¼
1853.										
January -	1¾	3¾	1¾	1½	½	2½	9¼	3¼	—	6¾
February -	¾	2¾	1¾	2¾	1½	1¼	2	8¼	—	5½
March -	1¾	4¼	3½	5½	1	1½	5¼	4	—	5¼
April -	4½	5	5	1	1	1¼	8¼	1¼	¼	1¼
May -	3¼	1¾	1¾	6¼	¾	¾	4	6½	¾	2½
June -	6½	¾	¾	2½	1½	1¼	2¾	6½	3	¾
July -	3½	¾	1½	2½	¾	¾	9¼	1¼	¾	¾

The wind reached force 8 or more in the eight days of September 20 times; during October, 18; November, 11; December, 1; January, 25; February, 10; March, 9; April, not at all; May, 11; June, 9; July, 4; August, not at all.

The Captain's private journal states that by March they had found a nearly constant breeze, which caused the cold to be severely felt, and obtained for the winter quarters the name of Windy Nook.

Table IX. is a summary of the four-hourly notations of the weather. The sky was most frequently clear in December, most often overcast in October, in which month there were the most frequent falls of snow. Rain fell for the first time May 19th, 4 p.m., wind S.E. 1. Snow, including rain, fell on 62 days, during the period of 326 days. During the autumn mist was scarcely noticed; but during the winter and spring it was frequently recorded, and during the summer it was less frequent, but more like fog.

The Temperature of the Sea Surface was 31° on September 23rd, and 34°·5 from the mean of observations, August 11th to 14th; no others were recorded.

THICKNESS OF ICE.

Date.			Thickness.	
y.	mo.	d.		
1852	9	30	Surrounded with ice, but not strong enough to bear.	
			ft.	ins.
"	10	18	0	3½
"	11	1	1	7
"	12	1	2	8½
1853	1	1	4	0½
"	2	1	5	6
"	4	1	6	7
"	5	1	8	2
"	6	1	7	2



THICKNESS OF ICE—continued.

Date.	Thickness.
y. mo. d.	ft. ins.
1853 6 14	6 6
" 7 1	6 0
" 7 15	5 2
" 7 26	Ice alongside from 3 to 5 feet thick.
" 7 27	Ice in motion.

Solar Radiation.—The effect of sunshine in heating a thermometer was observed, with the following results:—

MONTH. (Mean date.)	No. of Observations.	Mean Temperature.		
		In Shade.	In Sunshine.	In Sunshine.
1853.				
February 18 -	5	−36.6	− 8.3 on ship's side.	0
March 20 -	11	−12.5	+29.8	—
April 21 -	10	+ 4.5	44.5	+22.4 on ice.
May 13 -	13	19.3	45.4	39.0
June 3 and 4 -	2	32.5	47.0	48.0
" 9 and 25 -	2	36.5	54.5 bright bulb.	56.5 black bulb.
July 15 -	8	44.2	66.0	68.1
August 2 -	1	+40.0	+80.0	+81.0

From February 10th to June 4th a thermometer placed against the ship's bulwarks and another placed on the ice in sunshine were read; afterwards a bright-bulb thermometer and a black-bulb thermometer were read. No corrections have been applied to the readings from these thermometers.

The Game List, according to Sir R. Collinson's private journal, was as follows; the weight of fish was roughly estimated at 5½ tons:—

MONTH.	Bears.	Deer.	Hares.	Foxes.	Small Birds.	Ptar-migan	Ducks.	Geese.	Divers.	Fish.
1852.										
October -	—	1	—	—	—	21	—	—	—	—
November -	—	—	1	3	—	2	—	—	—	—
December -	—	—	—	—	—	—	—	—	—	—
1853.										
January -	—	—	—	—	—	8	—	—	—	—
February -	—	—	—	—	—	15	—	—	—	—
March -	—	—	—	—	—	7	—	—	—	—
April -	—	—	1	—	—	6	—	—	—	—
May -	1	—	2	—	—	6	—	—	—	—
June -	—	—	7	—	20	35	454	24	5	—
July -	—	—	2	—	—	—	180	—	2	—
August -	1	—	—	—	—	—	—	—	—	3,145
Total -	2	1	13	3	20	100	634	2	7	3,230

TABLE I.  
MEAN BAROMETICAL PRESSURE, at CAMBRIDGE BAY, 1852 September 23rd, to 1853 August 14th.

Hours.	1852.				1853.								Period.
	Sept. (8 days).	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug. (14 days).	
4 a.m. -	29.521	29.964	30.024	29.946	29.803	29.949	30.054	30.023	30.045	29.808	29.676	29.731	29.879
8 " -	.494	.965	.000	.925	.797	.940	.051	.012	.036	.800	.672	.716	.867
Noon -	.463	.943	.007	.927	.799	.945	.058	.000	.027	.800	.671	.714	.863
4 p.m. -	.475	.942	.011	.927	.808	.957	.063	.012	.021	.807	.668	.706	.866
8 " -	.506	.935	.010	.925	.797	.963	.059	.023	.031	.808	.676	.706	.870
Midnight -	.523	.951	.016	.926	.804	.957	.052	.032	.026	.817	.685	.715	.875
Means -	29.497	29.950	30.011	29.929	29.801	29.952	30.056	30.017	30.031	29.807	29.675	29.715	29.870

TABLE II.  
MEAN TEMPERATURE OF THE AIR, at CAMBRIDGE BAY, 1852 September 23rd, to 1853 August 14th.

Hours.	1852.				1853.								Period.
	Sept. (8 days).	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug. (14 days).	
4 a.m. -	+19.0	+2.7	−6.7	−29.7	−36.3	−30.4	−19.6	−9.4	+12.0	+28.2	+37.3	+36.1	+0.3
8 " -	20.2	3.8	6.9	29.7	36.8	30.1	19.5	−5.1	15.5	31.3	39.3	37.6	1.6
Noon -	21.0	5.5	6.2	29.6	35.7	27.4	14.8	+1.2	20.5	35.8	40.6	39.7	4.2
4 p.m. -	21.0	6.1	7.4	30.3	35.6	27.6	12.5	+3.7	22.4	36.3	43.5	41.4	5.1
8 " -	20.5	4.7	8.2	30.0	36.2	29.5	17.0	−0.9	18.8	34.4	40.4	39.4	3.0
Midnight -	+18.7	+3.8	−7.6	−29.9	−36.7	−30.7	−18.8	−7.1	+13.5	+29.0	+37.6	+36.9	+0.7
Means -	+20.1	+4.4	+7.2	−29.9	−36.2	−29.3	−17.0	−2.9	+17.1	+32.5	+29.8	+38.5	+2.5



TABLE III.

EXTREMES OF BAROMETRICAL PRESSURE, with ACCOMPANYING TEMPERATURE, WIND, AND WEATHER, at CAMBRIDGE BAY, 1852 September 23rd, to 1853 August 14th.

Month.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Weather.	Range.
1852.	d. h.	inches.				d. h.	inches.				inch.
September	25 16	29.92	+16.5	N.W.b.N.8	o c q	28 0	29.00	+21.0	W.N.W.8	b m g	0.92
October	10 20	30.38	+6.0	S.E. 1	o c s	19 12	.46	-9.0	N.N.E. 7	o c	0.92
November	12 4	.55	-10.5	" 2	b c	22 16	.32	-3.7	W. 4	o q	1.23
December	17 4	.40	-42.7	N.E. 1	b m	24 8	.39	-39.7	Calm	b	1.01
1853.											
January	24 4	.44	-36.0	W. 5	b	18 12	.17	-24.7	N.E.b.E.11	o c q m	1.27
February	21 0	.38	-18.0	N. 1	b c	1 4	.39	-29.2	S.W. 4	b	0.99
March	6 8	.61	-35.2	W.N.W.7	b m q	17 16	.52	-3.0	N.W. 6	o c s	1.09
April	28 4	.53	+9.7	N.E. 4	b c	4 0	.59	+7.5	N.E. 2	b m	0.94
May	1 12	.44	0.0	S.b.W.1	o s	19 8	.35	+37.0	S. 1	o r	1.09
June	25 4	.14	+32.0	E.S.E. 1	b c	19 8	.55	+34.0	N.W. 3	b q	0.59
July	3 12	.02	+40.0	E.N.E. 5	o f q	29 0	.27	+36.0	W. 9	o m r	0.75
August	6 20	29.87	+40.0	S. 1	b	3 4	.40	+48.0	Calm	b	0.47
Period	March	30.61	—	—	—	Sept.	29.00	—	—	—	1.61

TABLE IV.

EXTREMES OF AIR TEMPERATURE, with ACCOMPANYING PRESSURE, WIND, AND WEATHER, at CAMBRIDGE BAY, 1852 September 23rd, to 1853 August 14th.

Month.	Date.	Max.	Bar.	Wind.	Weather.	Date.	Min.	Bar.	Wind.	Weather.	Range.	Mercury frozen.
1852.	d. h.		inches.			d. h.		inches.				days.
September	23 0	+27.2	29.40	S.E. 6	o c q s	27 12	+16.5	29.23	N.W. 7	b c q	10.7	—
October	3 12	+23.4	.59	N.E. 1	o c s	16 16	-12.7	30.04	N.N.W.1	b	36.1	—
November	0 20	+21.7	.98	E.S.E. 4	b c	30 4	-23.3	29.93	N.E. 1	b c	45.0	—
December	1 8	-9.0	.80	N.E. 4	o	17 12	-46.5	30.32	Calm	b	37.5	10 1/4
1853.												
January	15 8	+12.7	.51	E.S.E. 7	o c q	6 12	-52.5	29.89	"	"	39.8	15
February	14 0	-1.5	.74	N.N.E. 8	o q s	4 16	-48.0	30.20	"	"	49.5	8 1/2
March	21 0	+18.0	30.09	S.E. 3	o	10 20	-50.2	.01	"	b m	68.2	4 1/4
April	22 4	+17.5	29.92	Calm	b c	9 16	-22.5	29.80	N.W.b.W.3	b c	40.0	—
May	19 4	+43.0	.40	S.E. 1	o r	0 16	-12.0	30.39	S.E. 1	b v	55.0	—
June	26 4	+49.0	.98	N.E. 2	b q	2 12	+16.5	29.91	" 5	b c	33.5	—
July	24 4	+55.0	.50	W. 2	b c	30 16	+32.0	.89	W.N.W.2	o c	23.0	—
August	2 4	+49.0	.78	S. 1	"	0 16	+33.0	.83	E.S.E. 1	b c	16.0	—
Period	July	+55.0	—	—	—	Jan.	-52.5	—	—	—	107.5	38

TABLE V.

SUMS OF WIND COMPONENTS, at CAMBRIDGE BAY, 1852 September 23rd, to 1853 August 14th.

Hours.	September (8 days) 1852.				October 1852.				November 1852.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	24.2	6.9	7.0	34.8	61.3	11.3	44.7	13.2	19.5	23.9	28.7	36.1
8 "	31.4	6.0	3.5	37.2	46.3	14.5	34.0	21.4	17.7	35.2	35.3	34.8
Noon	32.5	4.2	4.2	32.4	53.0	13.7	38.6	24.4	25.7	37.0	41.0	43.8
4 p.m.	23.6	—	—	39.9	51.5	12.3	45.1	16.6	25.3	34.9	28.3	44.5
8 "	21.2	1.5	2.5	33.8	55.4	13.5	31.5	16.8	24.3	34.6	32.4	36.3
Midnight	27.9	4.0	3.9	31.3	62.7	7.5	40.3	17.6	29.4	24.5	32.7	43.2
Means	26.8	3.8	3.5	34.9	55.0	12.1	39.0	18.3	23.6	31.7	33.1	39.8
Hours.	December 1852.				January 1853.				February 1853.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	33.1	3.9	15.5	27.4	26.0	14.9	26.4	66.8	40.5	12.3	25.8	30.6
8 "	38.1	4.8	16.8	36.8	33.7	15.8	27.3	53.8	41.2	11.5	27.8	32.3
Noon	44.1	3.9	18.9	41.5	37.6	14.5	28.3	55.0	52.0	7.8	35.1	27.3
4 p.m.	33.0	5.9	16.3	26.0	26.0	8.2	13.5	47.0	33.6	8.0	21.7	23.3
8 "	33.6	9.0	21.2	29.5	27.1	13.4	21.8	55.7	26.8	10.5	14.9	21.7
Midnight	42.4	8.9	26.9	36.6	34.4	14.7	29.6	55.0	36.9	9.1	22.7	31.7
Means	37.4	6.1	19.3	33.0	30.8	13.6	24.5	55.5	38.5	9.9	24.7	27.8
Hours.	March 1853.				April 1853.				May 1853.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	31.8	19.1	30.8	26.0	39.6	1.4	25.1	21.2	38.4	17.5	24.5	29.2
8 "	28.5	19.2	33.2	20.2	39.7	6.9	33.9	20.8	33.7	13.9	23.3	35.3
Noon	21.9	16.9	39.3	21.4	42.7	3.5	31.3	22.6	43.5	24.2	25.1	35.9
4 p.m.	23.2	22.1	32.7	20.8	46.8	1.4	34.8	17.4	38.9	17.7	24.9	35.8
8 "	27.2	21.1	33.6	24.3	43.7	4.6	26.9	14.0	34.1	28.8	24.9	34.1
Midnight	21.8	23.8	38.0	28.8	28.8	2.9	20.8	11.0	37.1	27.0	28.7	34.9
Means	25.7	20.4	34.6	23.6	40.2	3.5	28.8	17.8	37.6	21.5	25.2	34.2
Hours.	June 1853.				July 1853.				August (14 days) 1853.			
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.
4 a.m.	55.6	18.4	26.2	28.8	34.2	23.5	23.1	31.1	11.7	5.3	7.7	16.1
8 "	58.1	20.4	18.6	24.6	28.0	24.8	15.2	51.6	12.1	6.9	6.3	16.3
Noon	58.2	14.0	22.5	35.9	36.8	13.1	22.0	44.8	4.6	4.2	3.1	13.1
4 p.m.	56.2	10.2	17.4	27.8	34.9	18.5	18.6	51.6	6.9	1.8	3.5	13.9
8 "	62.2	17.8	19.6	19.7	36.9	19.1	23.7	36.2	7.3	6.1	3.7	21.1
Midnight	54.7	18.4	18.0	25.9	29.7	20.3	21.8	36.2	13.9	6.6	5.4	10.4
Means	57.5	16.5	20.4	27.1	33.4	19.9	20.7	41.9	9.4	5.1	5.0	16.2



TABLE VI.  
SUMS OF WIND COMPONENTS, with RESULTANT WINDS, at CAMBRIDGE BAY, for the Period,  
1852 September 23rd, to 1853 August 14th.

Hour.	Components.				Resultants.	
	N.	S.	E.	W.	Direction.	Force.*
4 a.m. - -	415.9	158.4	285.5	361.3	N. 17 W.	269
8 " - -	408.5	179.9	275.2	385.1	N. 25 W.	252
Noon - -	452.6	157.0	309.4	398.1	N. 17 W.	310
4 p.m. - -	399.9	141.0	256.8	364.6	N. 23 W.	281
8 " - -	399.8	180.0	256.7	343.2	N. 22 W.	236
Midnight -	419.7	167.7	288.8	368.6	N. 18 W.	261
Mean - -	416.1	164.0	278.7	370.1	N. 20 W.	268

\* Must be divided by 326, the number of days, to obtain the mean force by Beaufort's scale.

TABLE VII.  
MONTHLY RESULTANTS OF THE WIND, at CAMBRIDGE BAY, 1852 September 23rd, to  
1853 August 14th.

Month.	Resultants.	
	Direction.	Force.*
September 1852 - -	N. 54 W.	4.87
October " - -	N. 26 E.	1.55
November " - -	S. 40 E.	0.35
December " - -	N. 24 W.	1.10
January 1853 - -	N. 60 W.	1.15
February " - -	N. 6 W.	1.03
March " - -	N. 63 E.	0.40
April " - -	N. 17 E.	1.27
May " - -	N. 29 W.	0.60
June " - -	N. 9 W.	1.38
July " - -	N. 58 W.	0.81
August " - -	N. 69 W.	0.86

† In grades of Beaufort's scale.

TABLE VIII.  
SUMMARY OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12), at  
CAMBRIDGE BAY.

Months.				No. of Observa- tions.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
					O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
1852.																				
September	-	-	-	48	3	7'0	—	—	2	4'5	1	3'0	—	—	—	—	3	5'3	—	—
October	-	-	-	186	8	4'1	17	5'3	48	3'3	4	3'8	11	2'1	9	3'8	9	2'8	1	2'0
November	-	-	-	180	3	3'3	3	1'7	19	1'8	6	1'7	4	2'2	19	3'0	32	4'2	4	4'0
December	-	-	-	186	12	2'5	1	4'0	39	3'2	—	—	2	1'0	2	4'0	12	2'4	—	—
1853.																				
January	-	-	-	186	4	1'0	10	4'5	15	5'5	4	5'0	3	1'7	6	6'2	4	3'0	1	1'0
February	-	-	-	168	16	3'9	3	4'7	19	2'6	1	7'0	5	6'2	10	5'2	7	4'1	1	5'0
March	-	-	-	186	4	2'5	5	6'0	24	2'7	5	1'6	12	2'6	2	3'5	31	4'8	4	2'5
April	-	-	-	180	14	2'1	10	4'0	32	2'1	7	4'6	26	2'9	2	4'0	7	1'6	2	2'5
May	-	-	-	186	11	3'5	9	3'1	9	1'8	5	6'6	5	2'2	12	3'2	23	2'2	9	5'6
June	-	-	-	180	31	4'6	15	4'1	25	2'9	2	1'0	2	2'0	2	1'0	12	4'2	7	3'7
July	-	-	-	186	10	4'6	9	2'7	22	2'9	9	3'9	5	2'8	2	4'5	11	1'7	3	3'7
August	-	-	-	84	4	3'0	6	4'5	1	1'0	2	1'5	1	2'0	2	1'5	7	2'0	1	2'0

(continued).

Months.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		No. of Calms.			
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.				
1852.																						
September	-	-	-	1	2'0	-	-	4	6'5	7	9'6	8	6'8	12	7'6	7	7'6	-	-	-		
October	-	-	-	4	2'0	4	2'5	9	3'7	1	2'0	4	2'8	3	3'7	16	2'4	14	5'0	-	-	24
November	-	-	-	1	2'0	7	4'4	9	3'6	3	4'3	14	4'7	7	5'4	28	4'0	1	5'0	-	-	20
December	-	-	-	2	1'5	2	2'5	3	1'0	5	2'4	23	2'8	24	2'7	26	2'6	10	3'2	-	-	23
1853.																						
January	-	-	-	2	1'0	-	-	10	4'7	16	4'4	36	4'1	17	4'4	11	4'5	1	8'0	-	-	46
February	-	-	-	-	-	-	-	4	4'0	1	2'0	7	2'9	8	5'1	42	3'2	3	2'7	-	-	41
March	-	-	-	4	1'2	-	-	1	1'0	2	4'5	17	1'7	17	4'2	17	2'8	4	3'5	1	1'0	36
April	-	-	-	3	1'3	-	-	3	1'0	-	-	4	2'0	6	2'8	37	2'4	16	3'0	-	-	11
May	-	-	-	13	1'4	3	1'7	2	1'0	8	2'8	13	3'2	9	3'5	31	4'3	8	4'5	-	-	16
June	-	-	-	5	3'6	1	1'0	8	2'5	9	2'0	13	3'1	11	2'0	27	3'2	7	4'3	-	-	3
July	-	-	-	12	2'7	3	1'7	19	2'7	13	4'1	29	2'6	11	4'2	16	3'9	3	3'7	-	-	9
August	-	-	-	4	1'0	-	-	6	2'7	3	2'3	19	2'8	6	2'3	9	2'1	-	-	-	-	13



TABLE IX.

WEATHER NOTATIONS, at CAMBRIDGE BAY, 1852 September 23rd, to 1853 August 14th.

Hours.	September 1852.								October 1852.								November 1852.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	—	3	5	—	—	—	4	6	8	9	14	—	—	—	9	8	12	10	8	—	—	—	1	9
8 „	—	2	6	1	1	—	5	5	9	10	12	—	—	—	9	7	12	11	7	—	—	—	2	9
Noon	—	2	6	1	1	—	5	6	7	10	14	—	—	—	11	7	12	11	7	—	—	—	5	9
4 p.m.	—	2	6	—	1	—	6	5	7	9	15	—	—	—	9	4	16	12	8	—	—	—	1	7
8 „	1	3	4	—	1	—	3	5	8	11	12	—	—	—	7	5	10	10	10	—	—	—	4	7
Mdn.	2	4	2	—	—	—	1	6	8	10	13	—	—	—	9	4	13	11	6	—	—	—	3	8
Means	0.5	2.7	4.8	0.3	0.7	—	4.0	5.5	7.8	9.9	13.3	—	—	—	9.0	5.8	11.5	10.8	7.7	—	—	—	2.7	8.2
Hours.	December 1852.								January 1853.								February 1853.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	21	6	4	3	—	—	2	5	17	8	6	6	—	—	—	6	13	7	8	7	—	—	1	9
8 „	18	8	5	6	—	—	1	2	15	8	8	6	—	—	1	8	13	9	6	9	—	—	1	10
Noon	14	10	7	9	—	—	3	2	12	11	8	14	—	—	3	9	14	7	7	5	—	—	2	9
4 p.m.	15	6	10	4	—	—	5	3	14	8	9	7	—	—	1	9	13	7	8	10	—	—	—	5
8 „	15	9	7	9	—	—	1	6	16	6	9	9	—	—	3	10	15	7	6	7	—	—	—	6
Mdn.	19	9	3	2	—	—	2	9	17	7	7	10	—	—	2	8	13	7	8	8	—	—	—	9
Means	17.0	8.0	6.0	5.5	—	—	2.3	4.5	15.2	8.0	7.8	8.7	—	—	1.7	8.3	13.5	7.3	7.2	7.7	—	—	0.7	8.0
Hours.	March 1853.								April 1853.								May 1853.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	13	8	10	7	—	—	5	7	12	10	8	3	—	—	1	2	8	13	10	3	1	—	5	5
8 „	13	12	6	14	—	—	2	6	11	10	9	7	—	—	4	3	8	13	10	6	1	1	5	6
Noon	12	12	7	14	—	—	2	6	11	12	7	8	—	—	3	2	9	9	13	10	—	1	6	7
4 p.m.	12	10	9	5	—	—	1	3	12	11	7	4	—	—	3	2	8	10	13	8	—	1	8	4
8 „	17	8	6	8	—	—	4	5	16	9	5	5	—	—	2	3	10	8	13	6	—	1	7	6
Mdn.	13	8	10	7	—	—	5	7	13	10	7	3	—	—	1	3	8	11	12	8	1	1	8	10
Means	13.3	9.7	8.0	9.2	—	—	3.2	5.7	12.5	10.3	7.2	5.0	—	—	2.3	2.5	8.5	10.7	11.8	6.8	0.5	0.8	6.5	6.3
Hours.	June 1853.								July 1853.								August 1853.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	7	8	15	3	2	1	3	11	9	11	11	3	4	2	—	7	4	4	6	—	—	2	—	1
8 „	9	9	12	4	2	1	3	6	9	14	8	6	3	2	—	7	5	4	5	2	2	1	1	—
Noon	10	9	11	4	2	1	1	8	7	12	12	8	4	1	1	8	5	4	5	1	1	—	1	—
4 p.m.	12	12	6	—	—	3	2	6	12	12	7	3	1	3	—	7	5	6	3	—	—	2	—	1
8 „	10	11	9	5	—	1	2	9	14	14	3	6	—	2	—	4	4	6	4	—	—	2	*1	3
Mdn.	7	11	12	3	1	—	6	13	10	10	11	4	2	3	—	4	3	5	6	—	1	2	—	2
Means	9.2	10.0	10.8	3.2	1.2	1.2	2.8	8.8	10.2	12.2	8.6	5.0	2.3	2.2	0.2	6.2	4.3	4.8	4.9	0.5	0.7	1.5	0.5	1.2

\* Hail.

NOTES at CAMBRIDGE BAY, H.M.S. "ENTERPRISE."

## 1852.—SEPTEMBER.

- 23rd - - Lat. 68° 47' N., long. 108° 1' W.  
 24th - - „ 68° 54' „ 107° 42' Midn., bright aurora seen.  
 25th - - „ 68° 32' „ 109° 14' Stream of bay ice.  
 26th - - „ 68° 58' „ 106° 42' Quantity of young ice.  
 26th, 4.15 p.m. Anchored in Cambridge Bay.  
 29th - - Lat. 69° 3', long. 105° 8'. Young ice very strong and drifting fast.  
 30th - - „ 69° 3', „ 104° 58'.

## OCTOBER.

- 5th, 4 a.m. - Bright aurora.  
 17th, 4 a.m. and Mdn. Bright aurora.  
 20th - - Thick snow-drift, with N.E. gale.  
 21st - - Thick snow-drift, with N.W. gale.  
 28th - - Thick snow-drift, with N.E. gale.

## NOVEMBER.

- 12th, 4 a.m. - Bright aurora. 8 p.m., bright aurora; sound distinctly heard.  
 13th - - Two ravens seen.  
 23rd - - Thick snowdrift with W.N.W. gale.

## DECEMBER.

- 15th, 3 p.m. - Mercury froze, thermometers —60°.  
 20th, Noon - Bright aurora to N.E.

## 1853.—JANUARY.

- 2nd - - Thick snow-drift during Wly. gale.  
 3rd, 8 p.m. - Bright aurora.  
 5th, Midnight - Bright aurora to Ed.  
 6th, Midnight - Bright aurora to N.W.  
 7th, Midnight - Bright aurora.  
 8th, Noon - Refraction of the sun. Upper limb seen from the ship, after an absence of 39 days.  
 Midnight, aurora from S.E. to S.W.  
 9th, Midnight - Bright aurora.  
 10th, Midnight - Bright aurora.  
 12th, Midnight - Aurora.  
 15th - - Thick snow-drift during an E.S.E. gale.  
 17th, Midnight - Aurora to Ed.  
 23rd - - Thick snow-drift during N.W. gale.

## FEBRUARY.

- 1st, Midnight - Slight aurora.  
 2nd, Midnight - Bright aurora.  
 3rd, 8 p.m. - Aurora to S.W.  
 5th, 8 p.m. - Bright aurora.

R 2563.

3 F



6th, Midnight - Bright aurora.  
 9th, Midnight - Bright aurora from E. to W.  
 10th, Midnight - Bright aurora.  
 27th, 4 p.m. - Aurora bright to Wd.

## MARCH.

22nd - A balloon sent up; took a N.N.W. direction; surface wind N.E. 1.  
 23rd - A balloon sent up; took a S.Ely. direction; surface wind W. 1.  
 26th - A balloon sent up; took a Nly. direction; surface wind S.W. 1.

## APRIL.

10th, Midnight - Bright aurora.

## MAY.

13th - Sent up a balloon, which took a Sly. direction; surface wind N.W. 1.

## AUGUST.

4th - Ice setting into the bay.  
 6th - Young ice all over the bay.  
 9th - Ice setting into the bay.  
 10th, 1.15 p.m. Made sail.  
 11th - Lat.  $68^{\circ} 51'$ , long.  $105^{\circ} 40'$ . Working out of Cambridge Bay.  
 12th - "  $68^{\circ} 58'$ , "  $106^{\circ} 0'$ . A stream of ice.  
 13th - "  $68^{\circ} 42'$ , "  $108^{\circ} 27'$ .  
 14th - "  $68^{\circ} 24'$ , "  $139^{\circ} 39'$ .

## No. XXV.

## Results of Meteorological Observations made at Camden Bay.

H.M.S. "ENTERPRISE," Captain R. Collinson, C.B., having left Cambridge Bay in 1853 August 10th, reached Camden Bay, off Flaxman Island, on September 15th. The sea was nearly open, but the easterly winds had so packed the ice on the western horn of the bay as to form a barrier to her westward course. The position of the ship was latitude  $70^{\circ} 8' N.$ , longitude  $145^{\circ} 29' W.$ , and the land for a great distance from the shore is low. Here she passed the winter, and got clear 1854 July 20th.

The documents which have been consulted for data at Camden Bay are the ship's log, the master's log, and the captain's private journal. The instruments were the same as those used at Cambridge Bay and at Walker Bay (*vide* pp. 375-6).

Table I. contains the mean results, reduced to  $32^{\circ}$ , of the observations recorded from the marine barometer. On an average of the whole period, the diurnal range of the barometer shows maxima at 4 a.m. and 2 p.m., minima at 8 a.m. and 6 p.m. The greatest mean monthly barometrical pressure was  $30.3$  for November, and the least  $29.8$  for December.

Table II. gives results for the mean temperature of the air, deduced from observations of the thermometer on deck. The mean of the whole period is  $1^{\circ}.1$ , but the mean for the year would probably be  $4^{\circ}$ . The coldest month was February, for which the mean was  $-30^{\circ}.6$ , and the warmest was July  $37^{\circ}.7$ , so that the mean range was  $68^{\circ}.3$ .

Table III. exhibits the extremes of barometrical pressure in each month, with the air temperature, wind, and weather at the time. The highest pressure was  $30.99$  in March, the lowest  $29.13$  in December, so that the extreme range was  $1.86$  inches. The greatest range in any one month was  $1.74$  in March. In the winter half of the year the temperature of the air was lower and the winds lighter with the high, than with the low, extremes of pressure. Generally the weather was clear and fine with the high extremes of pressure.

Table IV. shows the extremes of air temperature with the barometrical pressure, wind, and weather which occurred at the time. The absolute maximum temperature was  $53^{\circ}$  in July, and the absolute maximum,  $-51^{\circ}$ , in December and also in February, giving the extreme range of temperature for the period  $104^{\circ}$ . During December and February the temperature was never above zero. During the winter half of the year extreme cold appears to be accompanied with high barometer, light wind, and fine weather, while high temperatures commonly occur with low barometer, strong wind, and overcast weather. This rule does not seem to hold good in summer.



Table V. gives the sums of the wind components every four hours in each month, with their means.

Table VI. gives the sums of the wind components for the entire period, and also their resultants, which show a tendency in the wind to veer from N.W. at noon to N.N.E. at 8 p.m., and back again, the force at these two epochs being at the maximum. The resultant wind for the period is N.N.W., force 0·27.

Table VII. gives the wind resultants for each month, calculated from the mean values in Table V. These resultants are apparently as frequent from the eastward as from the westward. The strongest resultant occurred in June from N. 75° E., but the westerly resultants of November and January were nearly as strong.

Table VIII. summarises the winds of each month under 16 directions, and gives their average force. It will be at once apparent that there is a tendency in the wind to blow, in spells, either from the W.N.W. or from the E.N.E. Calms occurred most frequently in the winter, though the prevalent winds of January, February, and March were from W. with mean force 5·2. The W. winds of November had mean force 7. These westerly winds seem stronger than the easterly, for during December, May, and June, when the latter were prevalent, the mean force was 4·8. In October, April, and July the westerly winds were nearly as frequent as the easterly. Force 8 and upwards was noted in September 6 times; October, 21; November, 42; December, 15; January, 28; February, 15; March, 29; April, 12; May, 16; June, 8; but not at all in July. The duration of the respective winds was summarised by Sir R. Collinson as follows :—

PREVAILING WINDS, in DAYS, at CAMDEN BAY.

Month.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Variable.	Calms.
1853.										
October	2	7½	5¾	—	—	2½	9¾	¾	½	2½
November	¼	½	8¾	—	¼	—	16	—	¼	4½
December	¼	1½	14	—	½	—	6½	—	½	7¾
1854.										
January	¼	—	3¾	¾	¼	¾	16¼	1½	1	6½
February	—	2	1½	—	—	¼	16	—	¼	8
March	1	2¼	6	—	—	—	15½	—	1	5¼
April	—	2¼	9¾	½	½	¾	10¾	1	¾	3¾
May	½	1	20	—	—	—	3	1¾	1¼	3½
June	3	5¼	14¾	—	—	—	1½	1	2½	2

Table IX. summarises the weather notations. During the period of 320 days, snow fell on 54 days, rain on 10 days, or precipitation occurred on 64 days. Its duration may be estimated at 43 days. Snow was most frequent in October, which had also the most squally weather. The clearest weather was in February and March, the former having no downfall, the latter very little snow, though both had frequent mists

or haze. Fog occurs in the summer months, and the atmosphere then is more frequently overcast. July 8th, at 7 p.m. 1 t r were registered; the wind, W.N.W. 6, had been E. 3 at 4 p.m., and veered to S.S.W. at midnight.

The Temperature of the Sea was only observed in September between 15th and 25th, when it was 28°, by a thermometer whose error is not known.

The Thickness of the Ice was measured at Camden Bay as follows :—

Date.			Thickness.
y.	mo.	d.	
1853	9	26	Young ice forming.
"	9	28	Frozen up.
"	10	1	0 feet 7 inches.
"	11	1	2 " 2 "
"	12	1	2 " 11 "
1854	1	1	4 " 4 "
"	2	1	5 " 0 "
"	3	1	6 " 0 "
"	4	1	6 " 2 "
"	5	1	7 " 0½ "
"	6	1	7 " 2 "
"	6	15	6 " 3 "
"	7	1	4 " 11 "

Solar Radiation.—The effect of sunshine upon a thermometer with bulb bright and another with bulb blackened was observed occasionally, and the following are the mean results for each month :—

Month. (Mean Date.)		Temperature.	
		In Shade.	In Sunshine.
y.	mo. d.		
1854	2 14	—38° 1	—18° 0 black
"	3 21	—23° 5	+ 7° 0 " —14° 5 bright.
"	4 17	+ 7° 7	+36° 5 "
"	5 22	+34° 0	+56° 0 "

No corrections have been applied to the thermometers in sunshine, and it will be noticed that the bright bulb is for the most part higher than the black bulb, contrary to usual experience. The highest readings in the sun were recorded May 15th, when the shade being 47°, the black bulb read 107°, and the bright bulb 102°.



TABLE I.

MEAN BAROMETRICAL PRESSURE, at CAMDEN BAY, 1853 September 15th, to 1854 July 31st.

Hours.				1853.				1854.							Period.
				Sept. (16 days).	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	
4 a.m.	-	-	-	29·890	29·882	30·307	29·809	30·127	30·004	29·996	29·874	29·844	29·861	29·842	29·949
8 „	-	-	-	·871	·872	·292	·788	·119	29·975	·971	·855	·827	·853	·833	·932
Noon	-	-	-	·885	·871	·304	·796	·121	·984	·980	·862	·827	·857	·838	·939
4 p.m.	-	-	-	·896	·872	·301	·800	·123	·991	·981	·858	·822	·852	·831	·939
8 „	-	-	-	·898	·879	·300	·802	·115	·990	·978	·867	·816	·850	·829	·938
Midnight	-	-	-	·906	·896	·301	·813	·115	·991	·982	·879	·824	·849	·844	·945
Means	-	-	-	29·891	29·879	30·301	29·801	30·120	29·989	29·981	29·866	29·827	29·854	29·836	29·940

TABLE II.

MEAN TEMPERATURE OF THE AIR, at CAMDEN BAY, 1853 September 15th, to 1854 July 31st.

Hours.				1853.				1854.							Period.
				Sept. (16days).	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	
a.m.	-	-	-	20 <sup>0</sup> ·1	-1 <sup>0</sup> ·6	-9 <sup>0</sup> ·7	-24 <sup>0</sup> ·2	-16 <sup>0</sup> ·6	-33 <sup>0</sup> ·0	-22 <sup>0</sup> ·5	-5 <sup>0</sup> ·5	18 <sup>0</sup> ·7	31 <sup>0</sup> ·2	36 <sup>0</sup> ·8	-0 <sup>0</sup> ·6
8	„	-	-	20·1	-1·5	-8·8	-24·5	-15·5	-31·3	-21·4	-2·5	21·7	32·5	37·8	+0·6
Noon	-	-	-	21·2	+0·4	-8·4	-25·2	-13·7	-28·4	-16·6	+2·7	25·5	33·4	38·7	+2·7
4 p.m.	-	-	-	21·2	+0·1	-9·2	-25·6	-14·5	-28·5	-13·8	+4·5	25·6	33·9	38·4	+2·9
8	„	-	-	20·2	-0·3	-9·6	-25·0	-15·4	-30·8	-18·1	-1·2	23·2	32·6	37·5	+1·2
Midnight	-	-	-	19·3	-1·8	-10·2	-24·7	-15·5	-31·3	-20·3	-5·1	19·8	30·8	36·9	-0·2
Means	-	-	-	20·4	-0·8	-9·5	-24·9	-15·2	-30·6	-18·8	-1·2	22·4	32·4	37·7	+1·1

TABLE III.

EXTREMES OF BAROMETRICAL PRESSURE, WITH ACCOMPANYING TEMPERATURE, WIND, AND WEATHER, at CAMDEN BAY, 1853 September 15th, to 1854 July 31st.

Months.	Date.	Highest.	Temp.	Wind.	Weather.	Date.	Lowest.	Temp.	Wind.	Weather.	Range.
1853.	d. h.	inches.	°			d. h.	inches.	°			inch.
September	- 29 16	30·08	- 4	W.S.W. 4	b c q	14 20	29·51	+ 27	E. 7	o q s	0·57
October	- 21 20	·71	- 1	E.b.S. 5	b c v	9 0	·16	+ 24	E.N.E. 9	o m q	1·55
November	- 15 0	·71	- 26	W.b.N. 1	b c	9 12	·74	+ 11	W. 10	o q s	0·97
December	- 31 12	·36	- 39	W. 2	b v	6 16	·13	- 26	„ 5	b c q	1·23
1854.											
January	- 19 4	·70	- 32	N.W. 1	b c v	25 20	·58	- 12	„ 7	„	1·12
February	- 15 16	·51	- 47	Calm	„	25 12	·43	- 25	Calm	b c v	1·08
March	- 25 0	·99	- 31	E.b.S. 1	b v	5 20	·25	- 7	„	o m	1·74
April	- 27 8	·32	+ 7	E. 5	b c v	17 20	·46	0	W.S.W. 1	o m s	0·86
May	- 1 16	·48	0	„ 8	b m q	30 8	·45	+ 34	Calm	b c v	1·03
June	- 2 16	·27	+ 35	E.b.S. 3	b c	30 12	·50	+ 32	E.N.E. 5	c m g	0·77
July	- 13 12	·13	+ 34	E.S.E. 1	b c m	0 16	·47	+ 32	„ 5	c m q	0·66
Period	- March.	30·99	—	—	—	Dec.	29·13	—	—	—	1·86

TABLE IV.

EXTREMES OF AIR TEMPERATURE, WITH ACCOMPANYING PRESSURE, WIND, AND WEATHER, at CAMDEN BAY, 1853 September 15th, to 1854 July 31st.

Month.	Date.	Max.	Bar.	Wind.	Weather.	Date.	Min.	Bar.	Wind.	Weather.	Range.	Mercury frozen.
1853.	d. h.	°	inches.			d. h.	°	inches.			°	days.
September	- 22 0	+ 31	29·91	E. 1	o g	29 16	- 4	30·08	W.S.W. 4	b c q	35	—
October	- 8 12	+ 24	·28	E.N.E. 11	0 q s	29 20	- 20	·16	W. 5	b m q	44	—
November	- 26 16	+ 18	30·15	W.b.S. 6	0 c q	6 4	- 32	·54	E.S.E. 1	b m	50	—
December	- 21 8	- 4	29·58	E.b.N. 10	b q	11 12	- 51	29·97	Calm	b c	47	5½
1854.												
January	- 14 8	+ 27	·91	W.S.W. 9	0 m g	28 8	- 49	·87	"	b	76	4
February	- 13 4	- 5	·70	" 9	b m q	9 12	- 51	30·18	"	"	46	9¾
March	- 28 8	+ 16	·92	W.b.N. 7	0 q s	17 12	- 47	·32	"	b v	63	2¾
April	- 30 8	+ 17	30·20	E. 4	b c	4 16	- 26	·03	S.W. 1	b	43	—
May	- 29 0	+ 46	29·75	W. 1	b c v	1 16	0	·48	E. 8	b m q	46	—
June	- 1 4	+ 46	·94	E. 1	"	16 12	+ 23	29·97	E.b.N. 6	0 g p s	23	—
July	- 18 12	+ 53	·74	W. 7	m g q r	2 12	+ 27	·63	" 4	b	26	—
Period	- July.	+ 53	—	—	—	Dec. } Feb. }	- 51	—	—	—	104	22



TABLE V.  
SUMS OF WIND COMPONENTS, at CAMDEN BAY, 1853 September 15th, to 1854 July 31st.

Hours.	September (16 days) 1853.				October 1853.				November 1853.				
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.	
4 a.m.	-	0.7	2.5	50.0	10.4	39.4	12.1	38.6	51.2	14.1	8.1	16.9	92.0
8 „	-	0.8	4.5	49.0	15.2	34.6	16.0	52.1	54.9	18.0	8.2	20.0	101.4
Noon	-	—	4.7	47.0	12.4	34.7	7.1	49.1	60.1	12.1	7.8	17.1	95.8
4 p.m.	-	1.4	5.3	48.4	14.0	37.1	7.2	40.8	48.4	12.8	9.7	16.9	95.3
8 „	-	1.0	3.5	49.9	11.5	40.4	11.6	45.0	55.5	13.2	7.4	20.4	100.3
Midnight	-	0.7	3.5	50.0	7.2	37.7	9.0	53.6	66.5	12.9	9.0	17.4	96.4
Means	-	0.8	4.0	49.0	11.8	37.3	10.5	46.5	56.1	13.8	8.4	18.3	96.9
Hours.	December 1853.				January 1854.				February 1854.				
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.	
4 a.m.	-	10.6	2.1	62.4	12.7	16.2	10.0	16.9	104.6	5.9	3.3	5.5	58.7
8 „	-	11.5	6.1	69.0	16.4	10.8	8.2	17.1	93.6	8.5	4.0	4.5	68.0
Noon	-	12.1	4.0	56.3	17.9	6.7	8.8	10.8	100.5	9.1	8.0	10.1	59.1
4 p.m.	-	10.6	2.7	66.3	15.0	5.4	9.2	9.8	92.6	9.2	6.2	12.7	64.1
8 „	-	14.1	3.9	69.7	19.4	8.6	9.4	12.7	77.6	6.8	4.5	14.0	57.0
Midnight	-	8.9	3.1	72.9	12.7	8.4	7.5	10.7	97.3	4.3	5.0	10.4	64.8
Means	-	11.3	3.6	66.1	15.7	9.3	8.8	13.0	94.4	7.3	5.2	9.5	62.0
Hours.	March 1854.				April 1854.				May 1854.				
	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.	
4 a.m.	-	10.1	0.4	14.6	65.4	8.4	3.0	34.7	35.3	2.2	3.6	76.7	10.7
8 „	-	11.6	0.8	19.7	75.7	9.5	3.4	45.9	47.9	8.9	4.0	82.6	2.9
Noon	-	15.0	3.2	26.6	96.7	8.5	3.6	49.3	43.2	5.4	5.7	85.1	5.6
4 p.m.	-	16.9	2.1	28.5	91.4	6.7	3.0	46.6	37.9	5.6	0.4	82.5	6.8
8 „	-	24.6	1.9	25.1	87.1	8.3	1.1	46.0	28.5	5.8	3.6	82.6	5.4
Midnight	-	16.3	—	18.8	85.6	8.3	1.6	39.8	34.5	5.1	2.9	93.8	8.6
Means	-	15.7	1.4	22.2	83.6	8.3	2.6	43.7	37.9	5.5	3.4	83.9	6.7
Hours.	June 1854.				July 1854.								
	N.	S.	E.	W.	N.	S.	E.	W.					
4 a.m.	-	19.3	1.0	90.1	2.1	14.8	16.5	35.8	34.9				
8 „	-	20.5	3.4	85.8	6.4	13.1	15.4	27.1	35.8				
Noon	-	22.0	1.0	73.3	8.7	12.9	11.5	28.3	36.9				
4 p.m.	-	20.6	1.2	77.7	2.3	14.3	8.6	39.9	31.5				
8 „	-	27.8	2.3	87.4	3.1	11.9	11.0	47.5	24.4				
Midnight	-	26.3	0.6	96.5	1.0	11.0	17.3	33.3	28.2				
Means	-	22.7	1.6	85.1	3.9	13.0	13.4	35.3	32.0				

TABLE VI.  
SUMS OF WIND COMPONENTS, with RESULTANT WINDS, at CAMDEN BAY, for the Period 1853 September 15th, to 1854 July 31st.

Hours.	Components.				Resultants.	
	N.	S.	E.	W.	Direction.	Force.*
4 a.m.	-	141.7	62.6	442.2	478.0	N. 24 W. 87
8 "	-	147.8	74.0	473.7	518.2	N. 31 W. 86
Noon	-	138.5	65.4	453.0	536.9	N. 49 W. 111
4 p.m.	-	140.6	55.6	470.1	499.3	N. 19 W. 90
8 "	-	162.5	59.2	500.3	469.8	N. 17 E. 108
Midnight	-	139.9	59.5	497.2	502.8	N. 4 W. 81
Mean	-	145.2	62.7	472.7	500.8	N. 19 W. 87

\* These figures must be divided by 320, the number of days, to get the mean force by Beaufort's scale.

TABLE VII.  
MONTHLY RESULTANTS OF THE WIND, at CAMDEN BAY, 1853 September 15th, to 1854 July 31st.

Months.	Resultants.	
	Direction.	Force.*
September 1853	-	N. 85 E. 2.35
October "	-	N. 20 W. 0.92
November "	-	N. 86 W. 2.63
December "	-	N. 81 E. 1.97
January 1854	-	W. 2.63
February "	-	N. 88 W. 1.95
March "	-	N. 77 W. 2.03
April "	-	N. 45 E. 0.27
May "	-	N. 88 E. 2.50
June "	-	N. 75 E. 2.80
July "	-	S. 83 E. 0.10

\* In grades of Beaufort's scale.



TABLE VIII.

SUMMARY OF WINDS, referred to SIXTEEN POINTS, with MEAN FORCE (Scale 0 to 12),  
at CAMDEN BAY:

Month.	Total Observa- tions.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.		S.S.E.	
		O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.
September 1853.	96	—	—	—	—	1	2.0	2	2.5	56	5.1	—	—	—	—	—	—
October	186	8	2.2	11	2.8	38	3.6	12	8.2	14	4.1	7	3.6	1	1.0	—	—
November	180	—	—	1	3.0	3	1.0	9	1.5	23	2.0	23	2.0	1	1.0	—	—
December	186	1	1.0	2	1.0	5	1.4	25	4.1	49	5.0	12	4.2	—	—	—	—
January 1854.	186	1	1.0	—	—	—	—	3	2.7	11	2.9	14	2.8	1	1.0	—	—
February	168	—	—	—	—	3	1.0	13	3.2	7	2.1	—	—	1	2.0	—	—
March	186	4	1.2	2	1.0	13	2.2	7	2.6	26	3.5	4	1.2	—	—	—	—
April	180	3	1.0	1	1.0	9	1.3	10	2.6	45	4.8	5	2.6	4	1.0	—	—
May	186	2	1.5	2	1.0	6	1.7	10	2.6	97	4.5	11	3.8	—	—	—	—
June	180	9	1.3	9	1.4	26	3.5	20	4.6	69	4.8	7	3.0	—	—	—	—
July	186	1	1.0	6	2.0	2	1.0	20	3.2	35	2.7	22	1.8	7	2.3	3	2.0

(continued.)

Month.	S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.		Variable.		No. of Calms.
	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	O.	F.	
September 1853.	2	1.0	—	—	7	3.1	5	4.4	10	3.3	1	2.0	2	1.0	—	—	—	—	10
October	—	—	1	7.0	8	4.5	11	5.5	31	5.4	24	3.7	5	1.6	1	1.0	1	1.0	13
November	1	2.0	4	1.0	—	—	9	7.1	48	7.2	34	5.2	3	2.0	—	—	—	—	21
December	1	1.0	2	1.0	—	—	1	1.0	18	2.5	25	2.0	—	—	—	—	1	1.0	44
January 1854.	3	1.7	—	—	4	1.7	14	5.1	63	6.0	25	4.7	6	2.0	—	—	2	1.5	39
February	—	—	—	—	1	1.0	14	5.3	59	4.1	22	2.9	1	1.0	—	—	—	—	47
March	—	—	—	—	—	—	3	7.7	61	5.5	32	4.5	2	2.5	1	1.0	1	1.0	30
April	1	1.0	—	—	2	1.0	7	2.3	41	3.6	20	3.0	3	2.0	1	1.0	—	—	28
May	1	1.0	2	1.5	—	—	—	—	13	1.4	11	1.5	6	1.0	1	1.0	—	—	24
June	—	—	—	—	—	—	1	4.0	9	1.1	2	2.0	6	1.0	3	1.7	4	1.0	15
July	4	1.5	4	4.5	5	3.8	8	.8	18	.2	30	2.8	6	1.8	—	—	1	1.0	14

TABLE IX.

WEATHER NOTATIONS, at CAMDEN BAY, 1853 September 15th, to 1854 July 31st.

Hours.	September 1853.								October 1853.								November 1853.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	—	3	13	5	—	—	8	10	6	11	14	13	—	—	8	11	12	9	9	10	—	—	1	10
8 „	1	3	12	2	—	—	9	10	7	9	15	9	1	—	7	15	10	8	12	9	—	—	4	9
Noon	1	1	14	5	—	—	6	9	5	10	16	15	1	—	5	13	9	8	13	7	—	—	2	7
4 p.m.	—	2	14	5	—	—	6	8	8	11	12	7	—	—	7	12	9	8	13	7	—	—	3	8
8 „	1	4	11	6	—	—	6	9	10	7	14	11	1	—	7	7	11	8	11	8	—	—	4	9
Mdn.	1	2	13	8	—	—	6	8	7	8	16	8	1	—	14	14	12	8	10	8	—	—	3	9
Means	0.7	2.5	12.8	5.2	—	—	6.8	9.0	7.2	9.3	14.5	10.5	0.7	—	8.0	12.0	10.5	8.2	11.3	8.2	—	—	2.8	8.7
Hours.	December 1853.								January 1854.								February 1854.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	14	10	7	10	—	—	2	11	10	9	12	14	—	—	3	11	12	12	4	10	1	—	—	4
8 „	11	10	10	13	—	—	4	3	8	12	11	13	—	—	4	8	10	14	4	14	—	—	—	4
Noon	11	10	10	12	—	—	—	3	10	10	11	19	—	—	3	9	9	14	5	16	—	—	—	3
4 p.m.	9	9	13	12	—	—	—	5	9	12	10	16	—	—	3	4	10	15	3	15	2	—	—	6
8 „	13	10	8	13	—	—	3	5	12	9	10	15	—	—	4	4	10	14	4	11	1	—	—	4
Mdn.	13	8	10	9	—	—	4	8	12	8	11	14	—	—	4	8	13	11	4	10	—	—	—	6
Means	11.8	9.5	9.7	11.5	—	—	2.2	5.8	10.2	10.0	10.8	15.2	—	—	3.5	7.3	10.7	13.3	4.0	12.7	0.7	—	—	4.5
Hours.	March 1854.								April 1854.								May 1854.							
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.
4 a.m.	15	10	6	12	—	—	2	9	10	7	13	11	2	—	4	7	7	9	15	12	1	—	5	9
8 „	13	14	4	16	—	—	—	7	9	11	10	14	3	—	5	7	7	9	15	10	1	1	6	7
Noon	12	15	4	16	—	—	2	9	10	12	8	11	1	—	4	6	8	11	12	12	1	—	2	6
4 p.m.	11	15	5	15	—	—	1	5	9	13	8	11	2	—	5	5	8	11	12	9	2	—	3	2
8 „	15	13	3	12	—	—	1	5	10	13	7	13	—	—	2	3	5	10	16	15	2	—	5	6
Mdn.	17	11	3	9	—	—	1	9	11	9	10	8	1	—	5	6	5	10	16	11	1	1	10	8
Means	13.8	13.0	4.2	13.3	—	—	1.2	7.3	9.8	10.9	9.3	11.0	1.5	—	4.2	5.7	6.7	10.0	14.3	11.5	1.3	0.3	5.2	6.3
Hours.	June 1854.								July 1854.															
	b.	c.	o.	m.	f.	r.	s.	q.	b.	c.	o.	m.	f.	r.	s.	q.								
4 a.m.	3	5	22	6	5	3	4	6	3	13	15	15	7	5	—	3								
8 „	7	9	14	7	5	1	3	2	4	11	16	13	8	5	1	2								
Noon	8	12	10	5	3	1	3	3	5	15	11	12	8	4	—	4								
4 p.m.	9	9	12	6	3	1	1	5	6	13	12	9	6	2	1	3								
8 „	6	9	15	10	7	—	3	3	6	9	16	8	5	5	—	4								
Mdn.	5	6	19	7	7	—	5	5	4	11	16	12	4	6	—	4								
Means	6.3	8.4	15.3	6.8	5.0	1.0	3.2	4.0	4.7	12.0	14.3	11.5	6.3	4.5	0.3	3.3								



## NOTES at CAMDEN BAY, H.M.S. "ENTERPRISE."

## 1853.—SEPTEMBER.

15th - - Lat.  $70^{\circ} 8' N.$ , long.  $145^{\circ} 29' W.$  Two bears seen.  
 16th - - Lying fast to a large floe.  
 26th - - A bear seen.  
 29th, 9.30 p.m. and Midnight. Bright aurora.  
 30th, 2 a.m. - Bright aurora.

## OCTOBER.

1st, Midnight - Bright aurora.  
 2nd, 4 p.m. - Bright aurora.  
 5th, Midnight - Bright aurora to S.E.  
 6th, 2 a.m. - Bright aurora to S.W. Midnight, bright aurora.  
 12th, Midnight - Bright aurora.  
 13th, Midnight - Bright aurora to Sd.  
 14th, 4 a.m. - Bright aurora to N.W.  
 19th - - Large flock of ducks passed from N.Ed.  
 22nd, 8 p.m. - Bright aurora.  
 26th - - Flock of ducks seen going to N.W.  
 26th, 8 p.m. to Midnight. Bright aurora.  
 27th, 4 a.m. - Bright aurora. Thick snow-drift with a W. gale.  
 30th, 4 a.m. - Bright aurora.

## NOVEMBER.

1st, Midnight - Bright aurora.  
 2nd, 4 a.m. - Bright aurora. Temperature rose  $21^{\circ}$  in two hours. At 6 a.m. it was  $-11^{\circ}$ , Calm b c; and at 8 a.m.  $+10^{\circ}$ ; wind W. by S. 4, b m.  
 3rd, Midnight - Bright aurora.  
 4th, 4 a.m. - Bright aurora.  
 6th, Midnight - Bright aurora.  
 9th, 4 a.m. - Bright aurora.  
 9th - - Heavy snow-drift, with a W. gale.  
 10th, 8 p.m. - Aurora in bright vivid flashes.  
 11th, 4 a.m. - Bright aurora.  
 12th, 4 a.m. - Bright aurora.  
 13th - - Thick snow-drift, with W. gale.  
 15th, 8 p.m. - Bright aurora.  
 18th, Midnight - Bright aurora.  
 20th - - A wolf seen.  
 24th - - Thick snow-drift, with W. gale.  
 27th - - Thick snow-drift during a W. gale. Thermometer rose  $20^{\circ}$  suddenly. At midnight it was  $-9^{\circ}$ , wind S. 2, o m. At 2 a.m.  $+13^{\circ}$ , W. by S. 6, o c q.

## DECEMBER.

3rd, Midnight - Bright aurora.  
 4th, Noon - Mercury froze at  $-38^{\circ} \cdot 5$ , showing the present state of thermometer correct.  
 4th, Midnight - Bright aurora.  
 5th, Midnight - Bright aurora.  
 7th, 4 a.m. - Bright aurora.  
 9th, 4 a.m. - Bright aurora.  
 11th, 8 a.m. - Bright aurora.  
 12th, 8 p.m. - Aurora to N.W.  
 19th, 4 a.m. - Bright aurora, and halo round the moon.  
 23rd, 4 a.m. - Bright aurora.  
 28th, 4 a.m. - Bright aurora.  
 30th, Midnight - Bright aurora.  
 31st, 4 a.m. and Midnight. Bright aurora.

## 1854.—JANUARY.

2nd, 8 p.m. - Bright aurora.  
 3rd, 4 a.m. - Bright aurora.  
 4th, 4 a.m. - Bright aurora.  
 8th, 4 a.m. - Bright aurora.  
 12th - - Thermometer rose suddenly, wind all round the compass. At 2 a.m.,  $-7^{\circ}$ , calm, b c m; at 4 a.m.  $0^{\circ}$ , S. 2, o c s; at 6 a.m.,  $+14^{\circ}$ , variable 1, o g s.  
 14th - - A fox seen.  
 19th, 4 a.m. and 8 p.m. Bright aurora. Upper limb of sun seen.  
 21st, 4 a.m. and Midnight. Bright aurora.  
 22nd - - Thermometer rose suddenly, with shift of wind, at noon. At 10 a.m.,  $-25^{\circ}$ , calm, b c v; noon,  $+6^{\circ}$ , W. by S. 5, b c; 4 p.m.;  $+12^{\circ}$ , W. 4, o g.  
 22nd, Midnight - Bright aurora.  
 23rd, 4 a.m. - Bright aurora.  
 27th, 4 a.m. - Bright aurora.  
 28th, Midnight - Bright aurora.  
 29th, 4 a.m. and Midnight. Bright aurora.  
 30th, Midnight - Bright aurora.  
 31st, 4 a.m. - Bright aurora.

## FEBRUARY.

1st - - A wolf seen.  
 2nd, Midnight - Bright aurora.  
 4th, 4 a.m. - Bright aurora.  
 7th, Midnight - Bright aurora from S.E. to S.W.  
 9th, Midnight - Bright aurora.  
 11th, Midnight - Bright aurora to S.E.  
 18th, Midnight - Bright aurora.  
 19th, Midnight - Bright aurora.  
 21st, Midnight - Bright aurora.  
 22nd, 4 a.m. - Bright aurora.  
 24th, 4 a.m. - Bright aurora.  
 25th, 4 a.m. and Midnight. Bright aurora.



## MARCH.

4th, 4 a.m. - Bright aurora.  
 16th, Midnight - Bright aurora.  
 17th, Midnight - Aurora, bright and coloured.  
 18th, Midnight - Bright aurora.  
 19th, Midnight - Bright aurora.  
 20th, 4 a.m. - Bright aurora.  
 23rd, Midnight - Bright aurora.  
 24th, 4 a.m. - Bright aurora.  
 25th, 4 a.m. - Bright aurora.  
 26th, 4 a.m. and Midnight. Bright aurora.  
 27th, 4 a.m. - Bright aurora.  
 28th, 4 a.m. - Bright aurora.

## APRIL.

8th, 1 a.m. - Bright aurora.  
 9th, 4 a.m. - Bright aurora.  
 10th, 4 a.m. - Bright aurora. Snow-bunting seen.  
 12th, Midnight - Aurora.  
 14th - - Water running. Midnight, aurora.

## MAY.

7th - - A raven seen.  
 13th - - A Sabine's gull seen.  
 15th - - A goose seen.

## JUNE.

2nd - - Temperature of sea in tide-hole, 1 foot below surface, 32°·5; 7 feet, 31°·5; 48 feet, 30°·5.

## JULY.

3rd - - Three bears seen.  
 8th, 6 p.m. - Sudden shift of wind from E. 3 to W. 2; thermometer rose to 41° from 39°.  
 8th, 11 p.m. - Sudden shift of wind from W.N.W. 3 to S.S.W. 4; thermometer rose from 37° to 42°.  
 12th - - A fox seen.  
 20th - - Left Camden Bay.  
 21st - - Lat. 70° 23' N., long. 146° 45' W.  
 25th - - " 70 25 " 148 8  
 27th - - " 70 31 " 148 12  
 28th - - " 70 35 " 149 23  
 30th - - " 70 46 " 149 33  
 31st - - A bear seen.

## LIST OF PUBLICATIONS, &amp;c.

Issued under the Authority of the Meteorological Council.

## OFFICIAL.

- No. 1. Report for 1867. Price 1s.  
 2. Instructions for Meteorological Telegraphy. New Edit. (1875.) Price 6d.  
 3. Fishery Barometer Manual. Price 6d.  
 4. Charts of Surface Temperature, South Atlantic Ocean. Price 2s. 6d.  
 5. Report for 1868. Price 5d.  
 6. Report for 1869. Price 10d.  
 7. Quarterly Weather Report for 1869.—Parts I. to IV. Price 5s. each.  
 8. Barometer Manual. (Out of print, see Nos. 24 & 40.)  
 9. Quarterly Weather Report for 1870.—Parts I. to IV. Price 5s. each.  
 10. Report for 1870. Price 10d.  
 11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. Price 2s. 6d.  
 12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Latitude 40° N., for each Month of the Year. With a General Current Chart. Price 2s. 6d.  
 13. A Discussion of the Meteorology of the Part of the Atlantic lying North of 30° N., for the Eleven days ending 8th February 1870. Price, with Book of Charts, 5s.  
 14. Quarterly Weather Report for 1871.—Parts I. to IV. Price 5s. each.  
 15. Report for 1871. Price 10d.  
 16. Quarterly Weather Report for 1872.—Parts I. to IV. Price 5s. each.  
 17. Report for 1872. Price 1s.  
 18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. Price 2s.  
 19. Quarterly Weather Report for 1873.—Parts I. to IV. Price 5s. each.  
 20. Charts of Meteorological Data for Square 3. Lat. 0°–10° N., Long. 20°–30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. Price 20s.  
 21. Report of the Proceedings of the Meteorological Congress at Vienna. Price 1s.  
 22. Report for 1873. Price 4d.  
 23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. Price 2s.  
 24. Instructions in the Use of Meteorological Instruments. Price 2s. 6d.  
 25. Quarterly Weather Report for 1874.—Parts I., II., and IV., Price 5s. each. Part III., 5s. 9d.  
 26. Report for 1874. Price 6d.  
 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic, which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. Price 24s.  
 28. Contributions to our Knowledge of the Meteorology of Japan.—By Staff-Commander Thomas H. Tizard, H.M.S. "Challenger." Price 1s.  
 29. Report for 1875. Price 4d.  
 30. Quarterly Weather Report for 1875.—Parts I. to IV. Price 5s. each.  
 31. Report for 1876–7. Price 3s. 5d.  
 32. A Discussion of the Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. Price 15s.  
 33. Quarterly Weather Report for 1876 (New Series).—Part I. Price 6s. (Part II. in the Press.)  
 34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Part I. Price 2s. Part II. Price 10s. Part III. Price 6s.  
 35. Report for 1877–8. Price 1s.  
 36. Report of the Proceedings of the Meteorological Congress at Rome, 1879. Price 1s. 6d.  
 37. Report on the Meteorology of Kerguelen Island.—By the Rev. S. J. Perry, S.J., F.R.S. Price 3s.  
 38. Report for 1878–9. Price 5d.  
 39. Meteorological Observations at Stations of the Second Order for the Year 1878. Price 20s.  
 40. Aids to the Study and Forecast of Weather. By the Rev. W. Clement Ley, M.A. Price 1s.  
 41. Report for 1879–80. Price 1s.  
 42. Report for 1880–81. Price 1s. 2d.  
 43. Charts of Meteorological Data for the Ocean District adjacent to the Cape of Good Hope with accompanying Remarks. Price of the Charts 25s.; of the Remarks, 7s.  
 44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E. Price 7s. 6d.  
 45. Meteorological Observations at Stations of the Second Order for the Year 1879. Price 20s.  
 46. Report on the Storm of October 13–14, 1881.—By Robert H. Scott, F.R.S. Price 1s. 6d.  
 47. Rainfall Tables for the United Kingdom. Compiled by G. J. Symons, F.R.S. (In the Press.)  
 48. Report for 1881–2. (In the Press.)  
 49. Quarterly Weather Report for 1879 (New Series). Appendices and Plates. Price 27s.  
 50. Quarterly Weather Report for 1880 (New Series). Appendices and Plates. (In the Press.)  
 51. Hourly Readings, 1881 (New Series).—Part I. (In the Press.)

Sold by POTTER, 31 Poultry, and STANFORD, 55 Charing Cross.

The Annual Reports may be obtained of all Parliamentary Booksellers.

[P.T.O.]



# LIST OF PUBLICATIONS, &c.

Issued under the Authority of the Meteorological Council.

## NON-OFFICIAL.

- |  |  |
|--|--|
| <p>No. 1. Report to the Committee on the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. Price 6<i>d</i>.</p> <p>2. Report to the Committee on the Meteorology of the North Atlantic.—By Captain H. Toynbee, Marine Superintendent. Price 1<i>s</i>.</p> <p>3. Report to the Committee on the Use of Isobaric Curves.—By Captain H. Toynbee, Marine Superintendent. Price 1<i>s</i>.</p> <p>4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. Price 6<i>d</i>.</p> <p>5. On the Winds, &amp;c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. Price 6<i>d</i>.</p> <p>6. Report of the Proceedings of the Meteorological Conference at Leipzig. Price 1<i>s</i>.</p> <p>7. Notes on the form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, M.A., F.R.S. Price 6<i>d</i>.</p> | <p>No. 8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. Price 6<i>d</i>.</p> <p>9. Report of the Permanent Committee of the Vienna Congress for 1874. Price 1<i>s</i>. 6<i>d</i>.</p> <p>10. On the Physical Geography of that part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875, by Captain Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. Price 1<i>s</i>. 6<i>d</i>.</p> <p>11. Report of the Permanent Committee of the Vienna Congress for 1876. Price 2<i>s</i>.</p> <p>12. Reports to the Permanent Committee of the Vienna Congress on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy. Price 2<i>s</i>.</p> <p>13. Report of the Permanent Committee of the Vienna Congress for 1878. Price 6<i>d</i>.</p> <p>14. Report of the International Meteorological Committee Meeting at Berne, 1880. Price 1<i>s</i>.</p> |
|--|--|

Sold by POTTER, 31 Poultry, and STANFORD, 55 Charing Cross.