XXI. *Observations on the temperature of the ocean and atmosphere, and on the density of sea-water, made during a voyage to Ceylon. In a Letter to Sir* Humphry Davy, *LL. D. F. R. S. By* John Davy, *M. D. F. R. S.*

Read May 22, 1817.

My Dear Brother,

According to the promise contained in a former letter, I proceed to give you a short account of the observations which I made during my late voyage from England to Ceylon. At present, I shall confine myself chiefly to three topics, the specific gravity of the water of the ocean, and its temperature, and the temperature of the atmosphere; subjects of some importance in the natural history of our globe; and in which, I know, you are interested. Incidentally I shall notice the height of the barometer, the direction of the winds, and the state of the weather.

For the sake of brevity, I shall present the principal results of my observations in the form of a table, to which I shall add some explanatory notes and general remarks.

Time.	Latitude by Observation	Longitude by Chronometer.	Specific gravity of sea water at temp. 80.	Maximum temp. of the air in the 24 hours.	Minimum.	Mean.	Maximum temp. of the sea in the 24 hours.	Minimum.	Mean.	Barometer.	Winds.	Weather, &c.
	° ′	° ″		° ″	° ″	° ″	° ″	° ″	° ′	° ″		
Feb. 12	N. 9,	W 6,30				40,			48,		South	Clear.
14	48,28	10,20	10251	51,	49,	50,			51,	29,	SW	Cloudy with occasional sunshine.
15	47,53	10,28	10264	52,	50,	50, 7			52,	30,1	WNW	
16	46,28	13,50	10256	50, 5	49,	50,			52,	30,	North	
17	44,32	14,10		50,	49,	49, 6			52,	30,	NE	
18	42,54	15,47	10256	53,	51,	52,			53,	30,	ENE	
19	40,48	16,34	10256	53,	52,	52,25			53,	30,	SE	
20	40,21			56,	53,	54, 3			55,			Clear. A complete calm.
21	40,12			58,	56,	56, 6			56,		SSW	Cloudy, wind strong, sea rough.
24	39,24			57,	55,	56,			58,	30,4	NE	Clear, wind moderate after a strong gale for two days from the SW.
25	37, 5	21,35	10256	59,	58,	58, 5			59,	30,5	SE by E	
26	34,54	22, 5	10270	60,	59,	59, 5			60,	30,1	SE	
27	33,14	21,59	10264	61,	60,	60,			63,	30,2		
28	31,58	22,24	10260	61,	60,	60,			63,	30,		
29	30,41	22,23		61,	58,	59, 5			64,	30,1		
Mar. 1	28,25	23, 5	10260	64,	61,	63,			65, 5	30,2	ESE	
2	26,36	23,15	10273	64, 5	63,	63, 8			66,	30,2	E by S	
3	23,30	23, 6		65,	63, 5	64, 5	68,	66,	67,	30,2		Hazy.
4	21,32	22,36		66, 5	65,	65, 8	68,	67,	67, 5	30,1		Cloudy.
5	19, 1	22,47	10256	66, 5	65,	65, 8			68,	30,1	ESE	
6	16,47	22,37	10267	67,	63,	65, 3			68, 5	30,2	NE by E	Fine.
7	15, 4	21,26	10276	68,75	67,	64, 6			71,	30,		
8	12,56	20,20	10275	69, 5	68, 5	68, 8			71, 5	29,9	ESE	
9	11, 8	19,		73,	71, 5	72, 3			74,75		NE by E, E by S	
10	9,42	19,20	10276	76,	73	74, 3			76,	29 9	E by S	
11	8,23	19,16	10277	76,	71,75	74,			77,	29,0	N by W to S by E	
12	6,57	19,10	10277	79, 5	77,	77, 3	79,25	77, 5	78, 6	29,9	NW	
13	5,50	18,41		80,	77,25	78, 6	80,75	79, 5	8 , 4	29,8		Cloudy.
14	5, 4	18,50		79, 5	74,	76,	80, 5	78, 5	80,	29,	North	Thunder storms with heavy rain.
15	4, 9	19,15	10277	80,	78, 5	79,	81, 5	80,	80, 7	29,	S, SE by N	Pleasant.
16	4, 2	18,44	10275	82,	78, 5	79, 6	83, 5	80,	81, 8	29,4	SE by E	Calms and squalls with thunder storms and heavy rain in succession.
17	4, 0	18,30	10270	80,	74,	77,	81,	80, 5	80, 5	29,		
18	2,58	18,44	10270	77,75	76, 5	77, 5	79,75	79, 5	79, 5	29,	SE to E	
19	2,27	19, 2		80,	77,	78, 6	79,75	79,	79, 5	29,	SSE	Fine,
20	1,20	21,10	10264	80,	78,	79,	79,	79,	79,	29,	ESE	
21	S. 0,12	21,50	10264	79, 5	78,	78, 8	78,75	78,	78, 5	30,2	ESE	
22	1,28	22,20	10264	79, 5	78,	79,	79, 5	78, 5	79, 2	30,	SE by S	
23	2,29	23, 5		79,75	78,75	79,	79, 5	79,	79,25	30,	SSE	
24	4,13	23,15		80, 5	78,25	79, 3	80,	79,	79,75	30,	ES by S	
25	6,27	24,13		80, 5	79,	79, 6	80, 5	79,75	80,	30,		
26	8,46	24,21		80, 5	79,	79, 3	80,	79,	79,75	30,3	SE by E	
27	10,30	24,25	10263	80,	79,	79, 3	80,	79,75	79,75			
28	12,12	24,50		79,25	78,	78,	80,25	79, 5	80,	30,2	ESE	Cloudy, showers.
29	13,45	25, 7		80, 5	77,	79,	80, 5	80,	80,25	30,2	SE by E	
30	15,35	26,		81,	78,	79,	80,75	80,	80, 5	30,2	ESE	
31	17,42	27,		80,25	77,25	79,	80,75	77, 5	80,	30,2	SE by S, ENE	
Apr. 1	19,47	27,23		81,	78,	79, 4	81,	79, 5	80,	30,1	E by S	Very fine.
2	21, 3	27,27		80,	77, 5	78, 5	80,75	78, 5	80,	30,2		
3	22,36	26,30	10264	80,	77, 5	77, 7	80,25	79,	79,75	30,2	ENE	
4	23,44	26,29		80,	76,	77, 5	80, 5	79,	79,75	30,1		
5	24,22	26,27		79,75	76,	77,	80, 5	77,75	79,			

Time.	Latitude by Observation	Longitude by Chronometer.	Specific gravity of sea water at temp. 50.	Maximum temp. of the air in the 24 hours.	Minimum.	Mean.	Maximum temp. of the sea in the 24 hours	Minimum.	Mean	Barometer.	Winds.	Weather, &c.
	° ′	° ′		° ′	° ′	° ′	° ′	° ′	° ′	° ′		
Apr. 6	S. 25,22	W26,33		80,	75, 5	77, 8	79, 5	77, 5	78, 2		NNE	
7	26,30	26,29		79,	73,	75,75	78, 5	76,75	77, 3	30, 5	NW by W, ESE	Unsettled, frequent showers, lightning.
8				73, 5	70,	72, 6	78,	75, 5	76, 8	30, 7	ESE to S	
9				73,	70,	71, 6	77,	72,	74,	31,	ESE	Tempestuous, sun obscured, heavy rain, a great swell from the SE.
10	27,50			71, 5	70,	70, 7	73,	72,	72, 4	30, 5		
11				71,	68,	69, 5	74, 5	71,75	72,	30, 3		
12	29,17	25,25		73,	70,	71, 5	72,	70,	71,	29, 8	NE by E	Pleasant. [night fine.
13	30,16	23,10		71,75	70,	71,	71, 5	69, 5	71,		N by E, NW	Variable, the day squally, the
14	30,20	23, 5		74,	70,	71, 6	74,	71,	72,		Calm.	
15	30,25	20,	10256	73, 5	70, 5	71, 7	72, 5	71,	71, 7	30, 0	NE to NW	Pleasant.
16	31, 6	18,55		71,	66,	66, 5	71,25	67,	68, 6	29, 9	WSW, SSW	
17	31,48	17, 1		66,75	64,	65, 5	69,25	65,	68,	30, 7	SW by W	
18	32,12	16, 3		67,75	66,	67, 7	70,	68,	69,	30, 4	NW	Extremely damp, at night a little dew fell, the first observed.
19	33,29	15,17		71,	66,	68, 3	68, 5	65,	68,	30, 2	NNE	
20	33,58	10,48		67, 5	65,	66,	65,75	63,	65,	30, 1		
21	34,29	7,56		68,	63,	66,	66,25	65,	65, 7	30,		
22	34,26	5,30		64, 5	60,	62,	63,75	62, 5	63,	30, 1	SW	Air dryer, no dew.
23	34,25	3, 2	10253	64,	60,	62, 2	65,	63,75	64, 5	29, 7	W	Cloudy, some rain.
24	33,25	2,50		65,	61,	63, 5	66,	65,	65,25	29, 9	W by S	Cloudy.
25	33,43	0,43		63, 5	60, 5	61, 6	65,	63, 5	64, 2	30,	SW, SSE	
26	33,28	1, 2		62, 5	59,75	61,	64, 5	62,75	63, 6	30,	SW	
27	34,14	1, 1		61,	59,75	60, 3	64, 5	62, 5	63,75	30, 2		
28				63,	59, 5	62, 2	64, 5	62,	62, 6		E by N	Hazy.
29	35,33	2,13		64, 5	61,	62, 6	64,	62,	63,		W by N	Cloudy.
30	34,45	5,31	10251	65, 5	62, 5	63,75	64, 5	62, 5	63, 4			
May 1	34,36	7,13		66,	63,	64, 4	65,	61,75	64,	30, 1	NW	Fine.
2	34,32			64,	61,	64, 6	66, 6	63, 5	65, 2	30, 2	NW, SSE	
3	33,26	10,11		61,	59,	60, 5	63, 5	60,	62,	30, 3	SE by S	
4	34,32			60,	58,	58, 5	63,	61,	61, 9	30, 4		Cloudy.
5	35,22	11,23		60,	58,	58, 4	65,	61,75	62, 7	30, 5	SSE, SE by S	Fine.
6	34,28	12, 7		59,	58,	58, 9	65,	59,25	63, 4	30, 5	ESE, E by N	
7	35, 1	13,20		61, 5	58,	60,25	64,	60,	61, 6	30,		Cloudy.
8	34,23	14,17		63,	57, 5	60,25	64, 5	61,	63,	30, 3	NW, SW	Squally.
9	34, 1	15,31		58,	56, 5	57,	63, 5	62,	63,		SW by S	
10	34,24	16,45		62,	59,	60,70	62,75	61, 5	62,	30,7 to 29	NW, SSW	More clear and moderate.
11	34, 1	17,51	10259	60,	57,	58,	62, 5	57,	60,	30, 2	SWS	
12				58,	54,	56,	57,	55,	56, 2	30, 2		In sight of Table Mountain, and within soundings.
June 3			10251	56,	51,	54, 1	55,25	53,	55,			All day in soundings.
4				60,	55,	58, 4	62,	57,	60, 3		SSW	Still in sight of land, water still greenish,
5				62,	59,	59,75	65, 5	58,	63,		SSW	Out of sight of land, water blue.
6	34,15			62,	59,	60, 4	63, 5	62,75	63,		ENE	Pleasant.
7	34,53	15, 8		63, 5	60,	61,25	64,	61,	62, 6		NNE	
8	35, 1	16,42		61,	60,	60, 5	61, 5	59,75	60, 8			Cloudy.
9	36, 4	19,26		64,	59, 5	61, 6	66,	60, 5	60, 3		NW	Tempestuous.
10	35,57	24,	10253	62,75	58,	59, 1	71, 5	61,	66, 9		NW, SW	
11	35,36	27,19		58, 5	57,	57, 6	67, 5	61,	65,		SW	
12	35,50	28,30		64,	57,	62,	67,	64,	66, 3		NW	Improving.
13	35,53	30,53		64,	61,	62, 9	65,	63,	64, 2			Pleasant.
14	35,52	33,54		63,25	62,	62, 6	65,	63, 5	64, 4		SW, N by W	Fine.

Time.	Latitude by Observation	Longitude by Chronometer.	Specific gravity of sea water at temp. 80.	Maximum temp. of the air in the 24 hours.	Minimum.	Mean.	Maximum temp. of the sea in the 24 hours.	Minimum.	Mean.	Barometer.	Winds.	Weather, &c.
	° ′	° ′		° ′	° ′	° ′	° ′	° ′	° ′	′		
June 15	S. 35,31	W 36,		65,	59,	61, 3	64, 5	63, 5	63, 9	30,3	W by N, SW	
16	24,23	37,56		62,	60,75	61, 5	65, 5	64,	65,	29,8	SE, NW	Cloudy.
17	34,44	40, 7		65,	58,	61, 6	65,	61,	64,	30,3	NW, SE by S	A thunder storm.
18	33,48	42, 3		60,	58, 5	59, 5	65,	62,	63, 4	30,6	E by S	Pleasant.
19	34,48	42,24		63,	59, 5	61,	64,	61, 5	63,	30 to 31	NE	Cloudy, tempestuous, showery.
20	34,54	45,17		63,	61,	62,	64,	62,	62, 7	30,1	N	Incessant rain and thunder and lightning.
21	35, 7	48,40		63,	58,	61,	62,	60,	60, 9	30,	WNW	Improving.
22	34,34	51,35		62,	57,	59, 8	62,	60,	60, 9	30,1	W	
23	33,36	55,16		60,	57,	58, 7	62,25	61,	61, 5	30,1	W by S	Moderate.
24	32, 4	58,18	10260	60,	57,25	58, 3	62,25	61, 5	62,	30,1	SW, SE	Pleasant.
25	31, 2	60,		59,	56, 5	57, 3	62,	60,75	61, 2	30,1	NNW	Gloomy.
26	30,39	60,33		59,	57,	57, 2	63,	61,	61, 8	30,3	E by S, ENE	
27	30,48	60,36		61, 5	59, 5	60, 6	61, 5	60,25	61, 3	30,3	NE	
28	31,23	63,17		63,	61, 5	62, 5	63,75	62,	62, 5	30,2	N by E	
29	31,20	64,34		63, 5	62,	63,	63,75	61,	62, 5	30,1		
30	30,53	65,38		67,	62, 5	63,	65, 5	63, 5	64, 5	30,4	N, W by N	Fair.
July 1	30,58	65,45		66,	61, 5	63, 6	65,	63,25	63, 6	30,2	SW	Gloomy, some rain.
2	29,23	66,17		62,	62,	60, 7	67,	64,	65, 5	30,3	SE	Fair.
3	27,18	66,30		64,	60,	62, 4	68,75	65,75	67, 3	30,4	E	
4	24,45	65,45		67,	64, 5	65, 8	70 75	68,	69, 4	30,3	E by S, E by N	
5	21,45	65,25	10259	69,	67,	68,	72,	70,	71,	30,4	SE	
6	19,53	63, 1		71,	68,	69,	74,	72,	72, 5	30,		Off Rodriguez.
7	19,44	62,50		71,	69,	69, 5	73, 5	71, 5	72, 3	30,2	S by W	At night in sight of the Isle of France.
17	19,15	57,11		72,75	71,	71, 6	74, 5	72,	73,	30,1	E by S	Fair, out of sight of land.
18	18,14	57,30		74, 0	72,	72, 3	74,	72, 5	74, 7	30,2	E	
19	17, 6	57, 3		74, 5	72,	73, 4	75,	72, 5	74,	30,2	E by S	
20	15,46	58,		74, 5	72, 5	73, 6	76,25	75,	75, 8	30,2	ESE	Showers.
21	14,22	58,48		75,	74, 5	74, 7	76, 5	75,	76,	30,2	E	Night squally.
22	12,17	59, 3		76, 5	73, 5	75, 1	77,	74,25	75, 6	30,2	E by S	Fair.
23	10,12	60,		77,	74,75	75, 1	77, 5	75,	76,25	30,		
24	7,54	60,23		77, 5	72,	74, 6	77, 5	75,	75,75	30,		—— night squally.
25	5,42	60,51		76,	75,	75, 4	77,	75, 5	76, 2	30,1	SE	Squalls with rain.
26	4, 6	61,45		78,	76,	77,	78,25	75,75	76, 5			
27	2,40	62,51		78,	76,25	77,	79, 5	78, 5	79,		E by N	Cloudy, squalls with rain.
28	1,40	63,35	10253	79, 5	77, 5	78,	81,	77,	79, 1		NE	Improving.
29	1,14	63,30		79,	75, 5	78,	80, 5	78,	79, 4			Rainy night.
30	0,19	65,11		78,25	77,	77, 8	81,	79,	80, 2		SE	Pleasant.
31	N 0,22	66,36		81,	73, 5	77, 5	82, 5	78,	80, 5		W by N	Day calm, night rainy.
Aug. 1	0,30	67,52		77,75	75,	77,	80, 5	79, 5	80,		S by W	Much rain.
2	0,26	68,58		78,	76,	77, 5	81,	80,	80, 4		S by E, S by W	Unsettled, some rain.
3	0,58	70, 6		81,	78, 5	79, 9	81, 5	80,	80, 7		SSW	Fine
4	1,27	71,51		80, 5	78,75	79, 9	81,75	80,	80, 7		S by W	
5	1,17	73,53		81,	79,	79, 5	81, 5	79,75	81,		S	
6	1,37	75,36		80, 5	78,	79, 9	81,75	79, 5	80, 6		SW	
7	2,10	76,37		82,	76,	78, 8	83, 5	80,	81, 7		SW by W	Part of the day calm.
8	2,34	77,25		81,	77, 5	79, 6	82,25	79,25	80, 7		N by W	Pleasant.
9	2,30	77,53		82,	75, 5	77,	84,	78, 5	80, 3			Calm.
10	3,22	79, 4		79,75	77,	77, 6	79,75	78,25	79,			Calm till 4 P. M.
11	5,17	79,42		79,75	76,25	77, 6	79,	76,	77, 5		NW	Frequent squalls.
12	6,24			77,75	75,75	76, 6	78,	76,	76, 9		WNW	Pleasant, in sight of Ceylon, in soundings.

In all the experiments on the density of sea-water, the results of which are recorded in the Journal, the water used was taken from the surface of the ocean, in a large clean bucket. The results introduced before we passed the equator the first time, were procured at sea; the remainder, from 0° 12″ south lat. to Ceylon, were obtained on land from experiments made on specimens of water preserved in well corked phials. In the experiments on board ship, as soon as the water was drawn, its temperature was ascertained, and then it was immediately weighed. The balance employed was not very delicate, for a very delicate instrument does not answer at sea, on account of the ship's motion; however, it was pretty readily affected by $\frac{1}{10}$ of a grain. The glass vessel in which the water was weighed, was such a one as is commonly used at home; its capacity was equal to about 300 grains. In the experiments on shore, the same vessel was used, but a different balance, one of a more delicate construction. I have chosen the temperature 80° FAHRENHEIT, for which I have calculated all the results, because it is nearly the mean annual temperature of this place, and nearly the mean at sea, in the intertropical regions.

The experiments made at sea I do not of course value so much, as those made on land: considered, however, merely as approximations to the truth, which I am sure they are, the results favour the general conclusion already formed by some philosophers, that the ocean resembles the atmosphere in being (cæteris paribus) of nearly the same specific gravity throughout.

And farther, they lead to the conclusion, that the slight

variations of specific gravity observed, do not regularly conform to the difference of temperature.

That the specific gravity of the water of the ocean, in all its parts, however remote, should be nearly the same, is easily explained; it is indeed what might be expected from theory. It is more difficult, it appears to me, to account for the slight variations; I may remark, they appeared to me greatest when the sea was rough and agitated; and once the specific gravity of the water seemed diminished by a heavy fall of rain, viz. in lat. 4° north, and in long. 18° 13″ west, where we experienced a quick succession of tropical squalls.

Whether there is a specific gravity peculiar to the water of each zone, as a modern traveller of high authority endeavours to prove, I am greatly in doubt. From my own experiments, in which I cannot but put some reliance, I feel much inclined to infer the contrary, and especially from those made on land, which I know to be perfectly accurate. Several of these agree in giving the same specific gravity to specimens of water taken from parts of the ocean very remote from each other; for instance, the water from lat. 0° 12″ south, and 22° 36″ south, and that from 34° 25″ south, and the water that washes the shores of Colombo.

For ascertaining the temperature of the air and of the water of the ocean, I used delicate pocket-thermometers, the bulbs of which projected about an inch from the ivory scale. In the experiments on the temperature of the ocean, the water was tried the instant it was drawn, before it was affected by the air. To find the temperature of the air, I always chose the coolest part of the ship on deck, and always put the in-

strument in the shade, and exposed it to the wind, taking care not to bring it near any surface that had the power of radiating much heat, circumstances, I need not remark, of importance to be attended to, and, in consequence of the neglect of which, the temperature at sea, in the intertropical regions, has by most observers been overrated.

During the greater part of the voyage, observations were made every two hours, on the temperature both of the air and of the water; and with the kind assistance of the mates of the ship, Messrs. SLEIGHT and POWELL, intelligent and obliging men, they were carried on during the night as well as the day.

I am not aware that the law of the diurnal variation of the temperature of the atmosphere at sea, has been described by any writer. From the numerous observations, which I had an opportunity of making, between and bordering on the tropics, it appeared to me perfectly regular at a great distance from land, when the weather was fine, and the wind steady. In these circumstances, I found the air at its maximum temperature precisely at noon, and at its minimum towards sunrise. I shall give in illustration of the fact two instances from my note book.

April 2d. S. lat. 21° 3″. W. long. 27° 27″. Wind E. by S.

Hour.	Temperature.
6 A. M.	78° ″
8	79
10	79,5
12	80
2 P. M.	79,25
4	79

Hour.	Temperature.
6	78°,5″
8	78
10	78
12	77,75
2 A. M.	77,75
4	77, 5
6	77, 5

April 5th. S. lat. 24° 22″ W. long. 26° 27″. Wind ENE.

Hour.	Temperature.
6 A. M.	76° ″
8	77,5
10	78,25
12	79,75
2 P. M.	78, 5
4	77,75
6	77, 5
8	77
10	77
12	76, 5
2 A. M.	76, 5
4	76

Here we perceive the variation of the temperature of the air, following the course of the sun, pretty considerable whilst it is above the horizon, and very insignificant during the night; and this, I may remark, is a general fact at sea, and one of the principal features of difference between the temperature of the atmosphere over the land, and over the ocean.

The law of the regular variation of temperature, is frequently interrupted. Even in fine weather, when the air is not in motion, it is subject to interruption. During a calm, the variation of temperature is nearly the same as on land, the maximum degree of heat not being at noon precisely, but some time after, and for the same reason ; because there is an accumulation of heat, and not only in the ship, but actually in the water itself, as I may show by noticing the temperature of the air and of the sea, during even a short calm, hardly of 24 hours duration.

August 7th. N. lat. 2° 10″ E. long. 76° 37″.

Hour.	Temp. of air.	Of the sea.
6 A. M.	78°,5	80°
8	79,5	81
10	80,5	81,5
12	82	82,5
2 P. M.	82,5	83,5
3	82	83,5
4	81,5	

But the law is more remarkably interrupted during storms and unsettled weather, as a couple of instances will be sufficient to prove.

March 17th. N. lat. 4°. W. long. 18° 30″

Hour.	Weather.	Temp. of air.	of the rain water.
3 A. M.	Clear	80	
11	Rain approaching	77	76
11° 30	Just passed	74	73
12	Cloudy	79	
1 P. M.	After a shower	76,5	76
4		75	74

March 27th. S. lat. 10° 30″. W. long. 24° 25″.

Hour.	Weather.	Temp. of air.
5 A. M.	Fair	79
6	Rain approaching	78
6 30	Raining heavily	75,5
7	Rain just ceased	76,5
8	Sunshine	79,25
9	Raining	76
10	Cloudy	79,5
12	Fair	80,5

The showers in each instance were accompanied by hard gusts of wind, and thunder and lightning. The rain-water, the temperature of which was ascertained, was collected in a glass as it ran from the awning.

The equatorial regions appear to be particularly subject to storms, violent rain, and electrical phenomena, the effect of which, in diminishing the temperature, seems to afford a natural explanation of the comparative coolness, both of the atmosphere and the ocean, that we experienced each time we passed the line.

The temperature of the sea, it has been asserted by some writers, is subject to little or no diurnal variation. That this remark is far from correct, is evident from the slightest inspection of the Meteorological Journal; it is an opinion that could be formed only from hypothetical views, ill founded. The fact, as the Journal exhibits, is, that the diurnal change of the temperature of the sea is very nearly as great as that of the incumbent atmosphere. From all the observations I could make, when the circumstances were most favourable to accurate results, when the weather was fine, the sea smooth, and the land at a great distance, it appeared to me,

that the maximum temperature is about three in the afternoon, and its minimum towards sunrise. I shall give a single example in detail.

April 5th. S. 24° 22″. W. long. 27° 8″.

Hour.	Temp. of the sea.
8 A. M.	79,25
10	79 ,5
12	79, 5
2 P. M.	80
4	80, 5
6	80
8	79, 5
10	79
12	78, 5
2 A. M.	78
4	77,75
6	76

Like the atmosphere, the ocean is subject to irregularities of temperature. This fact is proved by the Journal in an ample manner. The causes which produce these irregularities may be divided, very generally, into three kinds, tempestuous weather, shoals, and currents.

Independent of other modes of operation, and they are various in tempestuous weather, superficial currents appear to be established in the course of the prevailing winds. If the wind be from a cold quarter, the temperature of this current is comparatively low, and *vice versâ*. This fact is manifest in the effect of the gales we experienced between the 7th and 12th of April, during which time, being south of the

equator, and the wind blowing from the south, the temperature of the sea was considerably reduced.

Where the sea is shallow, it is now a well established fact,* that the temperature of the water is comparatively low; an important circumstance, highly deserving the attention of the practical navigator; it may forewarn him of a bank in the darkness of night, when nothing else would indicate it, and put him on his guard when approaching low shores and shallows, time enough to avoid their dangers. In advancing towards the Cape of Good Hope, and in doubling that promontory, and in making Ceylon, I collected some observations on this subject, the results of which I shall now introduce. On making Table-bay, before land was to be seen, there was a decided fall of the temperature of the water, viz. from above 60 to 58, thus,

May 11th. S. lat 34° 1″. E. long. 17° 51″ at

8	A. M. the temp. of the water was	62,5
10	- - - -	62,5
12	- - - -	61,5
2	P. M. - - - -	61
5	- - - -	60
10	- - - -	58
12	- - - -	58
2	A. M. - - - -	58,5
4	Land in sight - - -	59
7	About 20 miles from land -	58
8	- - - -	57

* Observed by Dr. FRANKLIN, Mr. J. WILLIAMS, &c. See WILLIAMS's Thermometrical Navigation. Philadelphia 1790

10	- - - - -	56
12	- - - - -	56
2 P. M.	- - -	55
4	- - -	56
8 In soundings	- - -	56,5
10	- - - -	56,5
12	- - - -	55
4 A. M.	- - - -	55
6	- - - -	56,5
8	- - - -	56,5

During these two days we were gradually approaching land, at the average rate of about two miles an hour. The observations were continued, till we were within about two miles of the shore. The observations I made on leaving the bay, corresponded with the foregoing, as nearly as could be expected, considering the track was not precisely the same, and the cold season more advanced.

		° ″
June 3d.	8 A. M. Half a mile from land, temp. of water	53
	10 About three miles from land	54,25
	2 P. M. Off Robin Island, nine miles from Cape Town, in ten fathoms water -	55,25
	4 - - - - -	55,25
	12 - - - - -	54, 5
	2 A. M. - - - -	54, 5
	8 - - - - -	57, 5
	10 - - - -	57
	12 - - - - -	60
	2 P. M. - - - -	61
	4 - - - - -	62

Before four in the afternoon we were out of sight of the Cape of Good Hope, and in deep water.

In approaching Ceylon, and particularly the southern shore of the island, where the mean annual temperature appears to be about 80°, little or no change of temperature could be expected on entering shallow water; yet we experienced a manifest change, a reduction of at least two degrees on coming into soundings. When we were in north latitude 5° 17″, and east longitude by chronometer 79° 42″, the temperature of the water began to fall; in the morning at eight, it was 78° 5″ and at ten at night it was 76° 5″. Next morning, land was discovered.

From the observations, in general, on the temperature of the water, recorded in the Journal, there is reason to believe, that during the whole voyage we were frequently encountering currents. Many of the results stated, are scarcely to be explained on any other hypothesis. When the temperature of the water became suddenly reduced, I inferred we were either in a current from the poles, or over some high ground in the bed of the ocean; and the former conclusion was almost constantly confirmed by other observations. And on the contrary, when the temperature of the water experienced a sudden increase, I inferred that we were in a current flowing from the equatorial regions. The only current we passed, that appears to me to require particular notice, is the well known one, that flows round the bank of Lagullas, from the south-east coast of Africa. It is marked in all charts, and it has been pretty minutely, and very scientifically described, and its course explained by Major RENNELL,

but hitherto, I believe, no notice has been taken of its high temperature, or of the effect which I believe it has, in producing a curious phenomenon on the summit of the Table-mountain, not yet accounted for, viz. a dense covering of mist called the "table-cloth," which universally appears when the wind blows from the south-east. I shall copy from my notes, taken at the time, the observations I made in crossing this current.

June 10th. S. lat. 35° 57″. E. long. 24°.

Hour.	Temperature of the Sea.
6 A. M.	61
8	71, 5
10	70, 5
11	70
12	68
1 P. M.	68, 5
2	67, 5
4	68
5	67
6	66, 5
7	67
8	67
9	67
10	66,75
11	67
12	67
1 A. M.	67
2	67
3	61
4	61

Hour.	Temperature of the Sea.
5	64
6	66,75
7	66
9	67
10	67, 5
12	66
2 P. M.	67, 5
4	65, 5

Now, judging from the change of temperature, we appear to have suddenly passed from the bank of Lagullas into the current that flows round its borders. Major RENNELL, I believe, observes, that at the border of the bank, the current is strongest; the high temperature of the water there, at least ten degrees above the neighbouring sea, is readily accounted for on that idea. We appear to have continued in the current seventeen hours, the course the ship was going was nearly due east, her average rate 7.65 miles an hour, and hence, supposing we were sailing immediately across the stream, as probably we were, or very nearly, its width may be inferred to be about 130 miles; a distance little differing from that commonly assigned to it. Having traversed this current, we seem from the low temperature of the water for two hours, to have been passing a bank twelve miles wide, and then to have entered a second current running in the same direction as the first.

I have alluded to a connection between these currents and the covering of dense mist, that occasionally occurs on the Table-mountain, called the "Table-cloth." The connection is evident, and readily explained. The phenomenon only

presents itself when a cold wind blows, viz. the south-east. This wind must condense the aqueous vapour rising from the warm current, and carry it towards the land. During the short stay we made at the Cape, I once had an opportunity of seeing the mist advancing; it came rapidly over the surface of the sea, which it entirely concealed, whilst the air above was perfectly clear; it soon reached the land, spread along the coast gradually, ascended the mountain, and there remained almost stationary, enveloping the summit, sometimes encreasing and descending on the opposite side overhanging Cape Town, and sometimes diminishing and retreating. That it should remain so nearly stationary on the top of Table Hill, whilst the south-east wind continues, is not surprising, considering the height of this hill, 3582 feet above the level of the sea, its precipitous sides, and the extensive surface of its top; nor is it strange, that it should rarely descend, except when the wind blows hard, taking into account the situation of the ground beneath, sheltered and warm, and the site of a large town, from which a current of hot air must be constantly rising.

I cannot conclude, without insisting with Mr. JONATHAN WILLIAMS on the use of the thermometer at sea; if commonly employed, and the observations made with it recorded, a general knowledge might soon be obtained of the average temperature of all parts of the ocean, and a fund of curious and useful information might be collected, especially respecting currents and shoals, that to practical navigators could not fail of being highly serviceable.

In another letter, I propose communicating to you the

observations I have collected on the temperature of man and other animals in different climates. The experiments were made during my voyage, and during my stay at the Cape, and the Isle of France, and my residence at this place.

I remain, &c.

JOHN DAVY.

Colombo, Nov. 3, 1816.