PRELIMINARY RESULTS OF OCEAN MAGNETIC OBSERVATIONS ON
THE CARNEGIE FROM LYTTTELTON TO TAHITI, FANNING ISLAND,
SAN FRANCISCO, AND HONOLULU, NOVEMBER, 1920,
TO APRIL, 1921.¹

By J. P. AULT, *Commanding the Carnegie*.

(Observers: J. P. Ault, H. F. Johnston, R. R. Mills, H. R. Grummann, and R. Pemberton.)

I.—Lyttelton to Tahiti.

Date	Latitude	Long. East of Gr.	Carnegie Values			Chart Values				Chart Differences ²			
			Decl'n	Incl'n	Hor. Int.	Decl'n		Incl'n	H. I.a.	Decl'n		Incl'n	H. In. ³
						Brit.	U. S.	U. S.	U. S.	Brit.	U. S.	U. S.	U. S.
1920					c.g.s.				c.g.s.				
Nov. 19	43 29 S	173 09	17.3 E	.....	.....	17.0 E	17.0 E	.....	.....	0.3 E	0.3 E	.....	.....
20	44 20 S	174 46	17.7 E	.....	.....	17.4 E	17.5 E	.....	.....	0.3 E	0.2 E	.....	.....
20	44 51 S	175 50	.....	69.1 S	.216	.....	.....	68.4 S	.219	.....	.....	0.7 S	-3
20	44 59 S	176 13	18.2 E	.....	.....	17.8 E	17.8 E	.....	.....	0.4 E	0.4 E	.....	.....
21	44 49 S	176 43	18.1 E	.....	.....	17.8 E	17.8 E	.....	.....	0.3 E	0.3 E	.....	.....
21	45 08 S	177 00	.....	68.5 S	.210	.....	.....	68.5 S	.219	.....	.....	0.0	-9
22	46 01 S	177 31	18.6 E	.....	.....	18.3 E	18.3 E	.....	.....	0.3 E	0.3 E	.....	.....
22	46 09 S	178 51	.....	69.5 S	.215	.....	.....	69.1 S	.214	.....	.....	0.4 S	+1
22	46 11 S	181 55	19.0 E	.....	.....	18.6 E	18.5 E	.....	.....	0.4 E	0.5 E	.....	.....
22	46 14 S	183 10	.....	68.4 S	.219	.....	.....	68.2 S	.220	.....	.....	0.2 S	-1
22	46 15 S	183 43	19.2 E	.....	.....	18.6 E	18.6 E	.....	.....	0.6 E	0.6 E	.....	.....
23	46 23 S	185 58	19.3 E	.....	.....	18.7 E	18.6 E	.....	.....	0.6 E	0.7 E	.....	.....
23	46 24 S	187 40	.....	68.0 S	.221	.....	.....	67.8 S	.222	.....	.....	0.2 S	-1
23	46 23 S	188 20	19.2 E	.....	.....	18.8 E	18.6 E	.....	.....	0.4 E	0.6 E	.....	.....
24	46 25 S	189 43	18.6 E	.....	.....	18.8 E	18.6 E	.....	.....	0.2W	0.0	.....	.....
24	46 31 S	190 42	.....	67.3 S	.226	.....	.....	67.1 S	.224	.....	.....	0.2 S	+2
24	46 33 S	191 16	19.4 E	.....	.....	18.9 E	18.7 E	.....	.....	0.5 E	0.7 E	.....	.....
25	46 40 S	193 48	19.1 E	.....	.....	18.9 E	18.8 E	.....	.....	0.2 E	0.3 E	.....	.....
25	46 44 S	195 27	.....	66.7 S	.230	.....	.....	66.2 S	.228	.....	.....	0.5 S	+2
26	46 44 S	200 16	.....	66.1 S	.232	.....	.....	65.4 S	.230	.....	.....	0.7 S	+2
27	46 51 S	203 20	20.1 E	.....	.....	18.9 E	18.9 E	.....	.....	1.2 E	1.2 E	.....	.....
27	46 39 S	205 04	.....	65.3 S	.236	.....	.....	64.2 S	.232	.....	.....	1.1 S	+4
28	45 41 S	207 26	18.8 E	.....	.....	18.4 E	18.5 E	.....	.....	0.4 E	0.3 E	.....	.....
28	45 25 S	207 55	.....	63.5 S	.246	.....	.....	63.2 S	.239	.....	.....	0.3 S	+7
28	45 18 S	208 07	18.4 E	.....	.....	18.3 E	18.3 E	.....	.....	0.1 E	0.1 E	.....	.....
29	44 32 S	209 14	18.3 E	.....	.....	18.0 E	18.0 E	.....	.....	0.3 E	0.3 E	.....	.....
29	43 58 S	210 10	.....	62.1 S	.254	.....	.....	61.8 S	.247	.....	.....	0.3 S	+7
29	43 48 S	210 31	18.3 E	.....	.....	17.7 E	17.8 E	.....	.....	0.6 E	0.5 E	.....	.....
30	43 23 S	211 28	17.6 E	.....	.....	17.6 E	17.7 E	.....	.....	0.0	0.1W	.....	.....
30	43 28 S	212 07	.....	61.8 S	.256	.....	.....	61.2 S	.250	.....	.....	0.6 S	+6
30	43 31 S	212 22	17.5 E	.....	.....	17.6 E	17.7 E	.....	.....	0.1W	0.2W	.....	.....
30	43 32 S	212 30	17.8 E	.....	.....	17.6 E	17.7 E	.....	.....	0.2 E	0.1 E	.....	.....

¹ For previous table, see *Terr. Mag.*, v. 25, pp. 167-172.

² Charts used for comparison: U. S. Hydrographic Office Charts Nos. 1700, 1701, and 2406, for 1920; British Admiralty Chart No. 3777 for 1917. The chart differences are obtained by subtracting chart values, derived as explained in previous sentence, from the observed Carnegie values. In order to explain the significance of the letters E, W, N, S, as affecting the application of the chart differences, it may be stated that E and N have been treated as being plus, W and S as minus, the chart difference being equal to the Carnegie values minus the chart value. The horizontal intensity is always regarded as positive, and the signs plus and minus have their usual significance. Secular corrections have been applied only to declinations.

³ Expressed in units of third decimal C. G. S.

* Crossed 180th meridian; hence date, Nov. 22, repeated.

* Local disturbance, near Tahiti.

Date	Latitude	Long. East of Gr.	Carnegie Values			Chart Values				Chart Differences ²			
			Decl'n	Incl'n	Hor. Int.	Decl'n		Incl'n	H. In.	Decl'n		Incl'n	H. In. ³
						Brit.	U. S.			Brit.	U. S.		
1920													
Dec.													
1	43 21 S	216 15	.....	61.1 S	c.g.s. .260			60.8 S	c.g.s. .252			0.3 S	+8
1	43 13 S	216 21	17.8 E	.....		17.5 E	17.7 E	.....		0.3 E	0.1 E	.....	
2	42 10 S	217 09	17.6 E	.....		17.2 E	17.3 E	.....		0.4 E	0.3 E	.....	
2	41 23 S	217 56	.....	59.0 S	.268			59.0 S	.261			0.0	+7
2	41 05 S	218 08	17.4 E	.....		16.8 E	16.9 E	.....		0.6 E	0.5 E	.....	
3	40 03 S	218 54	17.0 E	.....		16.5 E	16.6 E	.....		0.5 E	0.4 E	.....	
3	39 10 S	219 48	.....	56.6 S	.277			56.1 S	.271			0.5 S	+6
3	38 53 S	220 06	16.2 E	.....		16.2 E	16.3	.....		0.0	0.1W	.....	
4	37 53 S	221 41	15.7 E	.....		15.9 E	15.9 E	.....		0.2W	0.2W	.....	
4	37 09 S	222 50	.....	53.8 S	.285			54.2 S	.282			0.4 N	+3
4	37 03 S	223 03	15.9 E	.....		15.7 E	15.6	.....		0.2 E	0.3 E	.....	
5	36 18 S	224 36	15.5 E	.....		15.6 E	15.5 E	.....		0.1W	0.0	.....	
5	36 18 S	225 29	.....	52.9 S	.288			52.9 S	.285			0.0	+3
5	36 18 S	225 31	15.5 E	.....		15.6 E	15.5 E	.....		0.1W	0.0	.....	
6	35 20 S	226 24	15.6 E	.....		15.3 E	15.2 E	.....		0.3 E	0.4 E	.....	
6	34 36 S	227 03	.....	50.6 S	.292			50.7 S	.291			0.1 N	+1
6	34 16 S	227 22	14.6 E	.....		15.0 E	14.9 E	.....		0.4W	0.3W	.....	
7	33 27 S	227 32	14.8 E	.....		14.8 E	14.7 E	.....		0.0	0.1 E	.....	
7	33 06 S	227 28	.....	49.1 S	.296			49.2 S	.294			0.1 N	+2
7	32 56 S	227 22	14.8 E	.....		14.6 E	14.5 E	.....		0.2 E	0.3 E	.....	
8	32 04 S	227 44	.....	48.1 S	.298			48.2 S	.297			0.1 N	+1
8	31 58 S	227 50	14.4 E	.....		14.3 E	14.3 E	.....		0.1 E	0.1 E	.....	
9	30 51 S	228 20	.....	46.3 S	.302			46.8 S	.300			0.5 N	+2
9	30 45 S	228 28	14.1 E	.....		13.9 E	13.9 E	.....		0.2 E	0.2 E	.....	
10	30 13 S	228 29	.....	45.2 S	.303			46.2 S	.300			1.0 N	+3
10	30 09 S	228 39	13.5 E	.....		13.8 E	13.8 E	.....		0.3W	0.3W	.....	
11	30 06 S	227 28	.....	45.7 S	.302			46.2 S	.301			0.5 N	+1
11	30 04 S	227 25	13.6 E	.....		13.7 E	13.8 E	.....		0.1W	0.2W	.....	
12	29 19 S	225 58	.....	45.2 S	.303			45.8 S	.302			0.6 N	+1
12	29 07 S	225 42	13.3 E	.....		13.4 E	13.4 E	.....		0.1W	0.1W	.....	
13	28 23 S	224 38	12.6 E	.....		13.1 E	13.3 E	.....		0.5W	0.7W	.....	
13	28 03 S	224 08	.....	44.1 S	.308			44.2 S	.306			0.1 N	+2
13	28 01 S	224 04	13.0 E	.....		13.0 E	13.1 E	.....		0.0	0.1W	.....	
14	27 26 S	223 18	12.8 E	.....		12.9 E	12.9 E	.....		0.1W	0.1W	.....	
14	27 20 S	222 51	.....	43.0 S	.310			43.7 S	.307			0.7 N	+3
14	27 14 S	222 41	12.9 E	.....		12.8 E	12.9 E	.....		0.1 E	0.0	.....	
15	26 46 S	221 59	12.1 E	.....		12.6 E	12.8 E	.....		0.5W	0.7W	.....	
15	26 08 S	221 21	.....	41.9 S	.314			42.5 S	.309			0.6 N	+5
15	25 52 S	221 07	12.2 E	.....		12.5 E	12.6 E	.....		0.3W	0.4W	.....	
16	24 37 S	219 51	12.0 E	.....		12.1 E	12.3 E	.....		0.1W	0.3W	.....	
16	23 56 S	219 03	.....	39.4 S	.319			40.4 S	.314			1.0 N	+5
16	23 42 S	218 46	11.7 E	.....		11.9 E	12.1 E	.....		0.2W	0.4W	.....	
17	22 42 S	217 35	11.7 E	.....		11.6 E	11.8 E	.....		0.1 E	0.1W	.....	
17	22 05 S	216 45	.....	37.2 S	.324			37.4 S	.318			0.2 N	+6
17	21 54 S	216 31	11.4 E	.....		11.4 E	11.6 E	.....		0.0	0.2W	.....	
18	21 11 S	215 34	11.2 E	.....		11.2 E	11.3 E	.....		0.0	0.1W	.....	
18	20 43 S	214 55	.....	35.4 S	.325			35.2 S	.323			0.2 S	+2
18	20 34 S	214 46	11.1 E	.....		11.1 E	11.1 E	.....		0.0	0.0	.....	
19	19 47 S	214 00	10.9 E	.....		10.9 E	10.9 E	.....		0.0	0.0	.....	
19	19 25 S	213 25	.....	34.0 S	.330			33.4 S	.327			0.6 S	+3
20	18 47 S	212 37	10.7 E	.....		10.6 E	10.6 E	.....		0.1 E	0.1 E	.....	
20	18 41 S	212 11	.....	32.1 S	.331			32.5 S	.328			0.4 N	+3
21	18 10 S	212 11	10.4 E	.....		10.5 E	10.5 E	.....		0.1W	0.1W	.....	
22	17 44 S	211 13	.....	31.2 S	.335			31.6 S	.331			0.4 N	+4
22	17 37 S	211 03	10.8 E	.....		10.4 E	10.3 E	.....		0.4 F	0.5 E	.....	

NOTES ON TRIP FROM LYTTELTON TO PAPEETE, TAHITI.

Some delay was occasioned by the tardy arrival of the stores ordered from San Francisco, but all business was finally transacted by November 19, and preparations for departure were completed. Leaving Lyttelton under tow at 1^h 15^m p. m., the tug was released by 3^h p. m., and we proceeded with engine running until we had cleared Banks Peninsula, when all sails were set. For three days the wind blew from the north, then shifted to the west and remained westerly for four days. The 180th meridian of longitude was crossed on November 22, and the date November 22 was repeated.

No heavy storms were met, however moderate gales blew on November 22, November 27, December 1, and December 5. From December 1 to December 10 the wind blew steadily from the north-west, driving the vessel about 600 miles east of her course. On December 14 we caught the southeast trade and were able to set the course for Papeete. No prolonged calms were experienced, and the engine was used on three occasions only and but for a few hours. When within 150 miles of Papeete we ran it for 48 hours against head winds or through calms and reached the port early on the morning of December 23.

Everyone enjoyed good health throughout and found the trip very pleasant after leaving the cold latitudes.

The total distance sailed from Port Lyttelton to Papeete was 4,262 miles, which gives a daily average of 122.5 miles for the 35 days at sea.

II.—*Tahiti to Fanning Island and to San Francisco.*

Date	Latitude	Long. East of Gr.	Carnegie Values			Chart Values				Chart Differences ^a			
			Decl'n	Incl'n	Hor. Int.	Decl'n		Incl'n	H. In.	Decl'n		Incl'n	H. In. ³
						Brit.	U. S.			Brit.	U. S.		
1921	° ' "	° ' "	° ' "	° ' "	c.g.s.	° ' "	° ' "	° ' "	c.g.s.	° ' "	° ' "	° ' "	° ' "
Jan. 4	16 45 S	209 36	10.3 E	29.3 S	.338	10.2 E	10.0 E	29.0 S	.335	0.1 E	0.3 E	0.3 S	+3
4	16 23 S	209 22	10.3 E	29.3 S	.338	10.1 E	10.0 E	29.0 S	.335	0.2 E	0.3 E	0.3 S	+3
4	16 14 S	209 20	10.3 E	29.3 S	.338	10.1 E	10.0 E	29.0 S	.335	0.2 E	0.3 E	0.3 S	+3
5	15 01 S	209 00	10.0 E	26.0 S	.341	10.0 E	9.8 E	24.5 S	.338	0.0	0.2 E	1.5 S	+3
5	14 15 S	208 55	9.8 E	26.0 S	.341	9.9 E	9.6 E	24.5 S	.338	0.1 W	0.2 E	1.5 S	+3
5	13 58 S	208 55	9.8 E	26.0 S	.341	9.9 E	9.6 E	24.5 S	.338	0.1 W	0.2 E	1.5 S	+3
6	12 37 S	208 53	9.7 E	21.7 S	.344	9.8 E	9.4 E	21.0 S	.342	0.1 W	0.3 E	0.7 S	+2
6	12 00 S	208 44	9.7 E	21.7 S	.344	9.8 E	9.4 E	21.0 S	.342	0.1 W	0.3 E	0.7 S	+2
6	11 48 S	208 43	9.2 E	18.6 S	.345	9.6 E	9.3 E	17.3 S	.346	0.4 W	0.1 W	1.3 S	-1
7	10 53 S	208 16	9.2 E	18.6 S	.345	9.5 E	9.2 E	17.3 S	.346	0.3 W	0.0	1.3 S	-1
7	10 14 S	208 12	9.2 E	18.6 S	.345	9.5 E	9.2 E	17.3 S	.346	0.3 W	0.0	1.3 S	-1
7	9 57 S	208 09	9.2 E	14.4 S	.347	9.4 E	9.0 E	13.1 S	.348	0.2 W	0.2 E	1.3 S	-1
8	8 46 S	207 43	9.0 E	8.7 E	.....	9.2 E	8.8 E	.....	.....	0.2 W	0.2 E	.....	.....
8	7 52 S	207 28	8.7 E	8.7 E	.....	9.0 E	8.7 E	.....	.....	0.3 W	0.0	.....	.....
8	7 35 S	207 24	8.6 E	8.6 E	.....	8.7 E	8.4 E	.....	.....	0.1 W	0.2 E	.....	.....
9	6 05 S	207 14	8.6 E	8.6 E	.....	8.7 E	8.4 E	.....	.....	0.1 W	0.2 E	.....	.....
9	5 13 S	207 00	9.1 S	8.5 E	.347	8.5 E	8.2 E	8.0 S	.348	0.0	0.3 E	1.1 S	-1
9	5 02 S	206 55	8.5 E	8.5 E	.....	8.5 E	8.2 E	.....	.....	0.0	0.3 E	.....	.....

Date	Latitude	Long. East of Gr.	Carnegie Values			Chart Values				Chart Differences ²			
			Decl'r	Incl'n	Hor. Int.	Decl'n		Incl'n	H. In.	Decl'n		Incl'n	H. In. ³
						Brit.	U. S.			Brit.	U. S.		
1921					c.g.s.				c.g.s.				
Jan. 10	4 11 S	206 27	8.6 E	.....	.....	8.4 E	8.1 E	.....	.....	0.2 E	0.5 E	.....	.....
10	3 20 S	205 52	.....	5.0 S	.347	.....	.....	.....	4.4 S	.348	.....	0.6 S	-1
10	3 04 S	205 42	8.3 E	.....	.....	8.2 E	8.1 E	.....	.....	0.1 E	0.2 E	.....	.....
11	1 40 S	204 56	8.0 E	.....	.....	8.2 E	8.0 E	.....	.....	0.2 W	0.0	.....	.....
11	0 37 S	204 40	.....	0.9 N	.348	.....	.....	.....	1.6 N	.346	.....	0.7 S	+2
11	0 12 S	204 35	8.1 E	.....	.....	8.2 E	8.0 E	.....	.....	0.1 W	0.1 E	.....	.....
12	1 33 N	204 27	8.1 E	.....	.....	8.2 E	8.0 E	.....	.....	0.1 W	0.1 E	.....	.....
12	2 23 N	203 51	.....	6.7 N	.341	.....	.....	.....	8.1 N	.342	.....	1.4 S	-1
12	2 33 N	203 31	8.0 E	.....	.....	8.2 E	8.0 E	.....	.....	0.2 W	0.0	.....	.....
13	3 17 N	202 10	8.2 E	.....	.....	8.1 E	8.0 E	.....	.....	0.1 E	0.2 E	.....	.....
13	3 39 N	201 26	.....	8.4 N	.337	.....	.....	.....	10.0 N	.340	.....	1.6 S	-3
13	3 45 N	201 18	7.6 E	.....	.....	8.1 E	8.0 E	.....	.....	0.5 W	0.4 W	.....	.....
14	4 00 N	200 36	8.2 E	.....	.....	8.1 E	8.0 E	.....	.....	0.1 E	0.2 E	.....	.....
15	5 22 N	200 30	8.9 E	.....	.....	8.1 E	8.0 E	.....	.....	0.8 E	0.9 E	.....	.....
15	6 08 N	200 23	.....	13.6 N	.334	.....	.....	.....	14.4 N	.335	.....	0.8 S	-1
15	6 26 N	200 20	8.0 E	.....	.....	8.1 E	8.0 E	.....	.....	0.1 W	0.0	.....	.....
16	7 50 N	200 07	8.2 E	.....	.....	8.3 E	8.2 E	.....	.....	0.1 W	0.0	.....	.....
16	8 39 N	200 06	.....	18.7 N	.324	.....	.....	.....	19.1 N	.330	.....	0.4 S	-6
16	8 57 N	200 06	8.6 E	.....	.....	8.6 E	8.6 E	.....	.....	0.0	0.0	.....	.....
17	10 27 N	199 42	9.0 E	.....	.....	8.8 E	8.8 E	.....	.....	0.2 E	0.2 E	.....	.....
17	10 31 N	199 41	8.9 E	.....	.....	8.8 E	8.8 E	.....	.....	0.1 E	0.1 E	.....	.....
17	11 13 N	199 30	.....	22.9 N	.321	.....	.....	.....	23.5 N	.322	.....	0.6 S	-1
17	11 30 N	199 25	8.6 E	.....	.....	9.0 E	9.0 E	.....	.....	0.4 W	0.4 W	.....	.....
18	13 22 N	198 47	9.2 E	.....	.....	9.4 E	9.4 E	.....	.....	0.2 W	0.2 W	.....	.....
18	14 17 N	198 23	.....	28.2 N	.312	.....	.....	.....	28.8 N	.311	.....	0.6 S	+1
19	16 09 N	197 31	9.6 E	.....	.....	9.9 E	10.0 E	.....	.....	0.3 W	0.4 W	.....	.....
19	16 18 N	197 25	.....	31.4 N	.305	.....	.....	.....	31.6 N	.304	.....	0.2 S	+1
19	16 26 N	197 18	9.6 E	.....	.....	10.0 E	10.0 E	.....	.....	0.4 W	0.4 W	.....	.....
20	17 21 N	196 23	10.0 E	.....	.....	10.1 E	10.2 E	.....	.....	0.1 W	0.2 W	.....	.....
20	17 42 N	196 07	.....	32.8 N	.301	.....	.....	.....	32.9 N	.299	.....	0.1 S	+2
21	18 36 N	195 34	10.2 E	.....	.....	10.2 E	10.4 E	.....	.....	0.0	0.2 W	.....	.....
21	19 18 N	195 12	.....	34.6 N	.297	.....	.....	.....	34.8 N	.295	.....	0.2 S	+2
21	19 26 N	195 08	10.2 E	.....	.....	10.3 E	10.5 E	.....	.....	0.1 W	0.3 W	.....	.....
22	20 49 N	194 22	10.4 E	.....	.....	10.5 E	10.6 E	.....	.....	0.1 W	0.2 W	.....	.....
22	21 14 N	194 00	.....	37.2 N	.292	.....	.....	.....	37.0 N	.290	.....	0.2 N	+2
23	22 10 N	192 28	10.6 E	.....	.....	10.6 E	10.7 E	.....	.....	0.0	0.1 W	.....	.....
23	22 32 N	191 56	.....	38.2 N	.289	.....	.....	.....	38.2 N	.288	.....	0.0	+1
23	22 37 N	191 50	10.8 E	.....	.....	10.6 E	10.7 E	.....	.....	0.2 E	0.1 E	.....	.....
24	23 02 N	191 03	10.7 E	.....	.....	10.6 E	10.7 E	.....	.....	0.1 E	0.0	.....	.....
24	23 30 N	190 18	.....	39.2 N	.285	.....	.....	.....	39.2 N	.285	.....	0.0	0
24	23 36 N	190 11	10.8 E	.....	.....	10.6 E	10.7 E	.....	.....	0.2 E	0.1 E	.....	.....
25	25 00 N	188 59	10.9 E	.....	.....	10.6 E	10.7 E	.....	.....	0.3 E	0.2 E	.....	.....
25	25 36 N	188 26	.....	41.2 N	.280	.....	.....	.....	40.8 N	.280	.....	0.4 N	0
25	25 41 N	188 21	10.6 E	.....	.....	10.6 E	10.7 E	.....	.....	0.0	0.1 W	.....	.....
26	26 47 N	187 37	10.8 E	.....	.....	10.6 E	10.7 E	.....	.....	0.2 E	0.1 E	.....	.....
26	27 26 N	187 17	.....	42.9 N	.276	.....	.....	.....	42.3 N	.277	.....	0.6 N	-1
26	27 44 N	187 14	10.7 E	.....	.....	10.6 E	10.7 E	.....	.....	0.1 E	0.0	.....	.....
27	28 54 N	186 40	10.9 E	.....	.....	10.6 E	10.6 E	.....	.....	0.3 E	0.3 E	.....	.....
27	29 11 N	186 33	.....	44.3 N	.275	.....	.....	.....	44.0 N	.275	.....	0.3 N	0
27	29 20 N	186 27	10.9 E	.....	.....	10.6 E	10.6 E	.....	.....	0.3 E	0.3 E	.....	.....
28	30 52 N	185 59	10.8 E	.....	.....	10.5 E	10.5 E	.....	.....	0.3 E	0.3 E	.....	.....
28	31 32 N	186 42	.....	47.0 N	.268	.....	.....	.....	46.5 N	.271	.....	0.5 N	-3
28	31 39 N	186 50	11.1 E			10.7 E	10.7 E			0.4 E	0.4 E		
29	32 34 N	188 30	11.6 E			11.2 E	11.2 E			0.4 E	0.4 E		

OCEAN MAGNETIC OBSERVATIONS

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Date	Latitude	Long. East of Gr.	Carnegie Values			Chart Values				Chart Differences*			
			Decl'n	Incl'n	Hor. Int.	Decl'n		Incl'n	H. In.	Decl'n		Incl'n	H. In.*
						Brit.	U. S.	U. S.	U. S.	Brit.	U. S.	U. S.	U. S.
1921					c.g.s.				c.g.s.				
Jan. 29	32 36 N	188 56	.....	48.5 N	.265	.....	.....	48.1 N	.268	.....	.....	0.4 N	-3
29	32 36 N	188 58	11.6 E	.....	.....	11.3 E	11.2 E	.....	.....	0.3 E	0.4 E	.....	.....
30	34 12 N	188 57	11.8 E	.....	.....	11.6 E	11.4 E	.....	.....	0.2 E	0.4 E	.....	.....
30	34 35 N	189 27	.....	50.4 N	.261	.....	.....	50.0 N	.264	.....	.....	0.4 N	-3
30	34 40 N	189 32	11.8 E	.....	.....	11.7 E	11.7 E	.....	.....	0.1 E	0.1 E	.....	.....
31	35 58 N	191 02	12.3 E	.....	.....	12.2 E	12.2 E	.....	.....	0.1 E	0.1 E	.....	.....
31	36 35 N	191 41	.....	52.7 N	.257	.....	.....	53.0 N	.259	.....	.....	0.3 S	-2
31	36 40 N	191 58	12.5 E	.....	.....	12.7 E	12.6 E	.....	.....	0.2 W	0.1 W	.....	.....
Feb. 1	38 23 N	194 31	13.6 E	.....	.....	13.7 E	13.6 E	.....	.....	0.1 W	0.0	.....	.....
1	38 24 N	194 39	.....	55.2 N	.251	.....	.....	54.8 N	.252	.....	.....	0.4 N	-1
2	38 36 N	195 05	14.0 E	.....	.....	13.8 E	13.8 E	.....	.....	0.2 E	0.2 E	.....	.....
2	38 36 N	195 10	13.6 E	.....	.....	13.9 E	13.9 E	.....	.....	0.3 W	0.3 W	.....	.....
2	38 43 N	196 08	.....	55.7 N	.249	.....	.....	55.3 N	.251	.....	.....	0.4 N	-2
2	38 44 N	196 15	14.3 E	.....	.....	14.2 E	14.3 E	.....	.....	0.1 E	0.0	.....	.....
3	38 56 N	197 23	14.5 E	.....	.....	14.5 E	14.6 E	.....	.....	0.0	0.1 W	.....	.....
3	39 12 N	198 36	.....	56.0 N	.251	.....	.....	56.2 N	.249	.....	.....	0.2 S	+2
3	39 14 N	198 42	15.3 E	.....	.....	14.8 E	15.0 E	.....	.....	0.5 E	0.3 E	.....	.....
4	40 01 N	201 29	16.5 E	.....	.....	15.7 E	15.8 E	.....	.....	0.8 E	0.7 E	.....	.....
4	40 02 N	201 37	16.1 E	.....	.....	15.8 E	15.8 E	.....	.....	0.3 E	0.3 E	.....	.....
4	40 01 N	202 08	.....	57.7 N	.246	.....	.....	57.6 N	.246	.....	.....	0.1 N	0
5	39 56 N	204 38	17.3 E	.....	.....	16.2 E	16.4 E	.....	.....	1.1 E	0.9 E	.....	.....
5	39 54 N	205 28	.....	58.0 N	.247	.....	.....	58.0 N	.247	.....	.....	0.0	0
6	40 05 N	209 03	18.0 E	.....	.....	17.5 E	17.4 E	.....	.....	0.5 E	0.6 E	.....	.....
6	40 04 N	209 10	.....	58.6 N	.247	.....	.....	59.2 N	.246	.....	.....	0.6 S	+1
7	39 58 N	211 05	17.8 E	.....	.....	17.8 E	17.7 E	.....	.....	0.0	0.1 E	.....	.....
7	39 58 N	211 10	18.1 E	.....	.....	17.9 E	17.8 E	.....	.....	0.2 E	0.3 E	.....	.....
7	39 54 N	211 58	.....	59.0 N	.247	.....	.....	59.4 N	.247	.....	.....	0.4 S	0
8	39 29 N	214 40	18.7 E	.....	.....	18.4 E	18.2 E	.....	.....	0.3 E	0.5 E	.....	.....
8	39 24 N	215 17	.....	59.1 N	.248	.....	.....	59.8 N	.248	.....	.....	0.7 S	0
9	39 03 N	217 45	18.8 E	.....	.....	18.5 E	18.5 E	.....	.....	0.3 E	0.3 E	.....	.....
9	39 04 N	217 58	18.9 E	.....	.....	18.7 E	18.5 E	.....	.....	0.2 E	0.4 E	.....	.....
9	39 02 N	218 45	.....	59.8 N	.249	.....	.....	60.0 N	.250	.....	.....	0.2 S	-1
10	38 39 N	221 58	.....	59.9 N	.250	.....	.....	60.2 N	.252	.....	.....	0.3 S	-2
11	38 22 N	224 10	.....	60.6 N	.249	.....	.....	60.4 N	.252	.....	.....	0.2 N	-3
12	37 57 N	225 24	.....	59.8 N	.254	.....	.....	60.2 N	.254	.....	.....	0.4 S	0
12	37 52 N	225 35	18.2 E	.....	.....	18.9 E	18.6 E	.....	.....	0.7 W	0.4 W	.....	.....
13	37 43 N	226 08	18.3 E	.....	.....	18.8 E	18.6 E	.....	.....	0.5 W	0.3 W	.....	.....
13	37 40 N	226 29	18.2 E	.....	.....	18.6 E	18.6 E	.....	.....	0.4 W	0.4 W	.....	.....
14	37 30 N	226 50	18.7 E	.....	.....	18.6 E	18.5 E	.....	.....	0.1 E	0.2 E	.....	.....
14	37 29 N	226 55	18.0 E	.....	.....	18.6 E	18.5 E	.....	.....	0.6 W	0.5 W	.....	.....
14	37 32 N	227 16	.....	59.9 N	.254	.....	.....	60.2 N	.256	.....	.....	0.3 S	-2
14	37 34 N	227 24	18.6 E	.....	.....	18.7 E	18.6 E	.....	.....	0.1 W	0.0	.....	.....
15	37 45 N	229 23	18.6 E	.....	.....	18.8 E	18.8 E	.....	.....	0.2 W	0.2 W	.....	.....
15	38 08 N	230 28	.....	60.8 N	.252	.....	.....	61.1 N	.252	.....	.....	0.3 S	0
16	38 44 N	230 53	19.3 E	.....	.....	19.3 E	19.2 E	.....	.....	0.0	0.1 E	.....	.....
16	38 50 N	230 49	.....	61.8 N	.246	.....	.....	61.8 N	.250	.....	.....	0.0	-4
17	38 40 N	230 50	18.6 E	.....	.....	19.2 E	19.1 E	.....	.....	0.6 W	0.5 W	.....	.....
17	38 34 N	231 11	.....	61.3 N	.252	.....	.....	61.6 N	.250	.....	.....	0.3 S	+2
17	38 34 N	231 19	18.8 E	.....	.....	19.2 E	19.1 E	.....	.....	0.4 W	0.3 W	.....	.....
18	38 21 N	233 19	18.8 E	.....	.....	19.1 E	9.0 E	.....	.....	0.3 W	0.2 W	.....	.....
18	38 14 N	234 00	.....	61.8 N	.250	.....	.....	61.8 N	.250	.....	.....	0.0	0
18	38 12 N	234 12	18.5 E	.....	.....	19.0 E	18.9 E	.....	.....	0.5 W	0.4 W	.....	.....
19	37 57 N	236 04	18.3 E	.....	.....	18.7 E	18.6 E	.....	.....	0.4 W	0.3 W	.....	.....

NOTES ON THE TRIP FROM PAPEETE, TAHITI, TO FANNING ISLAND
AND SAN FRANCISCO.

We left Papeete Harbor at 2 P. M., January 2, 1921, in the midst of a heavy tropical rain squall. The engine operated well and we were soon out beyond the reef where we could set sail.

Owing to the prediction of the pilot charts that the trade wind would be more northerly than easterly, there was some doubt that we would be able to make Fanning Island. The course was therefore kept well up to the wind in order to get to the east as much as possible. On the night of January 6 we passed near Flint Island. During the afternoon and night until we had passed the island, the wind shifted from E. by N. to N. by E., gradually heading the vessel more toward the island as our distance off decreased. This influence of the land, no matter how small in extent, over the prevailing wind, has often been noticed, and it is always advisable to keep off the land while passing, especially if intending to pass to windward and at night.

January 12 we passed the latitude of Christmas Island, but kept well to the eastward in order to insure making Fanning Island. Fortunately the wind held more from the east than from the north during the entire run from Papeete, so that we sighted Fanning Island at 10^h 00^m on January 14 from a good bearing, after being hove to 60 miles east of the island during the previous night. We arrived off Whaler's Anchorage and the cable station at 1^h 25^m, and after tacking back and forth for 2½ hours, during which time cablegrams were despatched, we took our departure for San Francisco.

The Pacific Cable Board has a station at Fanning Island on the line from Vancouver to Australia. About 30 men are on the station, some having their families with them. Electric lights, a cold storage plant, a tennis court, and several new quarters are among some of the improvements noted since the *Galilee* called in 1905 and again in 1906. The mooring buoy at Whaler's Anchorage has disappeared, but is to be replaced soon. Owing to the necessity of sailing that evening, we could not establish a magnetic station ashore. The old *Galilee* station is no longer available, owing to the extension of buildings and electric wiring.

As the vessel was now leaking more than usual, it was considered advisable to proceed to San Francisco and dock for examination. The course was kept somewhat eastward of the one planned, so that we passed through the Western Hawaiian Islands at Laysan Island instead of beyond the Midway Islands. From Fanning Island to Laysan there was no calm belt and no evidence of a proper northeast trade wind. The easterly wind blowing at Fanning Island continued after passing Laysan Island, often blowing from south of east. This cruise has been remarkable for a number of such failures or changes in the expected trade wind.

Laysan Island was passed at a distance of one mile on January

25. When first sighted it appeared as a streak of white on the horizon, and the color of the sand blended so well with the color of the sky and cloud background that it could not have been seen at night at a distance greater than about one-half mile, the limit of audibility of the surf on the beach. The island is about two miles long north and south by one mile wide, and the sand is heaped up to a ridge 50 feet high in places. The four buildings are boarded up, indicating the absence of human beings. Many birds were walking about on the sand hills. Except the two large cocoanut trees and one small bushy tree near the building, no vegetation was visible.

The position of the landing place near the group of buildings, from our observations, is $25^{\circ} 46'.1$ N., $171^{\circ} 42'.7$ W. This position depends upon a latitude observation on Venus simultaneous with a longitude observation on the Sun in the afternoon $2\frac{1}{2}$ hours before passing the island, and upon latitude and longitude observations from stars three hours later, taken 10 minutes after the last bearing was obtained on the island, at a distance of about $1\frac{1}{2}$ miles. There was no evidence of northerly or southerly current, and only 0.1 knot per hour westerly set between the two observed positions. The longitude has been corrected for chronometer error determined after arrival at San Francisco. The position as given on the chart and in the pilot books is $25^{\circ} 42'.2$ N., $171^{\circ} 44'.1$ W., for the lighthouse, which should be near the landing place as above. This shows the island to be 3.9 miles north of its charted position and 1.4 miles east.

Soundings of 8 and $8\frac{1}{2}$ fathoms were obtained one mile off the southern end of the island, where, also, numerous dark patches were noticed which seemed to indicate shallower water.

Although it had now become necessary to pump out the ship every one to two hours, using the rotary pump operated by the small engine during the daytime, yet it was decided to proceed up to 41° north latitude if possible and thence direct to San Francisco, in an attempt to cover the region as outlined in the original plans, as the vessel would not be in these latitudes soon again. We anticipated rough seas, due to the winter gales of the North Pacific, and a consequent increase in the leaking. However, it seemed that we would be able to control the leak unless something unforeseen should develop, so we decided to take the risk and proceed northward.

On January 28, in latitude 22° N., a northwesterly gale began which continued for four days and prevented us from making the desired intersection at 41° N. On February 1 course was therefore changed to proceed to San Francisco along the 39th parallel. From February 1 to February 11 southerly winds and gales continued without interruption. Owing to rough seas and consequent increase in leaking, it was necessary to proceed under greatly reduced sail. We were within 600 miles of San Francisco before these southerly winds changed. Had we been bound for Honolulu we would have been delayed many weeks.

On February 11 the wind changed to N. E., and began to blow a gale, and for 60 hours the vessel was hove to in a moderate to fresh gale, with heavy seas. Violent rain and sleet squalls were frequent during this time, and for two days fog and clouds prevented astronomical and declination observations. The wind gradually changed from N. E. to N. W., and moderated on February 14. On the evening of February 14 the wind shifted to the southeast and another gale began, which continued to February 16, shifting through east to north and northwest, and moderating to a calm on February 17. While the vessel was hove to on February 15 with only main staysail and foretopmast staysail set, a squall of hurricane force struck the vessel, tearing these two sails completely to ribbons in one blast. Within ten minutes the wind had practically died out, but after 30 minutes it sprang up again from the southeast and blew a gale again. The seas during these gales became very heavy and confused, due to the rapid changes of the direction of the wind. Fine weather prevailed February 17, 18, and 19. The good breeze from the S. W. on February 16 died out on February 19, so that it was necessary to proceed under power the last 15 hours. A good landfall was made at 1 P. M., February 19, by bearing on Point Reyes and the Farallon Islands, and the anchorage in San Francisco Bay was reached at 10 P. M., the same evening.

Declination observations were made daily with the exception of two days. Unusually good weather was found near the California coast, so that declinations were obtained where previous cruises had failed to get them on account of clouds and fog.

We arrived at San Francisco, after 47.3 days at sea. The average daily run was 128.9 miles for the 6,099 miles traversed.

III.—San Francisco to Honolulu.

Date	Latitude	Long. East of Gr.	Carnegie Values			Chart Values				Chart Differences ²			
			Decl'n	Incl'n	Hor. Int.	Decl'n		Incl'n	H. In.	Decl'n		Incl'n	H. In. ¹
						Brit.	U. S.			Brit.	U. S.		
1921	°	°	°	°	c.g.s.	°	°	°	c.g.s.	°	°	°	
Mar. 29	36 29 N	235 48	17.6 E	.....	.....	18.1 E	17.8 E	.....	.....	0.5W	0.2W	.....	.....
29	35 52 N	235 12	.....	59.8 N	.258	.....	.....	60.3 N	.260	.....	.....	0.5 S	-2
29	35 46 N	235 08	17.2 E	.....	.....	17.9 E	17.5 E	.....	.....	0.7W	0.3W	.....	.....
29	35 40 N	235 02	17.2 E	.....	.....	17.9 E	17.4 E	.....	.....	0.7W	0.2W	.....	.....
30	34 04 N	233 25	16.6 E	.....	.....	17.2 E	16.8 E	.....	.....	0.6W	0.2W	.....	.....
30	33 19 N	232 33	.....	57.1 N	.268	.....	.....	57.0 N	.269	.....	.....	0.1 N	-1
30	33 09 N	232 21	16.3 E	.....	.....	16.8 E	16.5 E	.....	.....	0.5W	0.2W	.....	.....
31	32 16 N	231 12	16.1 E	.....	.....	16.5 E	16.3 E	.....	.....	0.4W	0.2W	.....	.....
31	31 46 N	230 33	.....	54.8 N	.276	.....	.....	55.2 N	.276	.....	.....	0.4 S	0
31	31 37 N	230 21	16.1 E	.....	.....	16.0 E	15.9 E	.....	.....	0.1 E	0.2 E	.....	.....
Apr. 1	30 20 N	228 41	.....	53.0 N	.280	.....	.....	53.4 N	.283	.....	.....	0.4 S	-3
2	29 17 N	227 26	14.9 E	.....	.....	15.0 E	14.9 E	.....	.....	0.1W	0.0	.....	.....
2	28 52 N	226 57	.....	51.3 N	.284	.....	.....	51.6 N	.286	.....	.....	0.3 S	-2
2	28 43 N	226 47	14.5 E	.....	.....	14.9 E	14.7 E	.....	.....	0.4W	0.2W	.....	.....

Date	Latitude	Long. East of Gr.	Carnegie Values			Chart Values				Chart Differences ²			
			Decl'n	Incl'n	Hor. Int.	Decl'n		Incl'n	H. In.	Decl'n		Incl'n	H. In. ³
						Brit.	U. S.	U. S.	U. S.	Brit.	U. S.	U. S.	U. S.
1921					c.g.s.				c.g.s.				
Apr. 3	27 32 N	225 19	14.0 E	.....	.....	14.5 E	14.3 E	.....	.....	0.5W	0.3W	.....	.....
3	26 57 N	224 18	.....	48.4 N	.289	.....	.....	49.2 N	.289	.....	.....	0.8 S	0
3	26 51 N	224 00	13.3 E	.....	.....	14.1 E	14.0 E	.....	.....	0.8W	0.7W	.....	.....
4	26 20 N	221 55	13.6 E	.....	.....	13.9 E	13.7 E	.....	.....	0.3W	0.1W	.....	.....
4	26 05 N	220 51	.....	47.1 N	.289	.....	.....	47.8 N	.289	.....	.....	0.7 S	0
4	26 00 N	220 29	13.0 E	.....	.....	13.7 E	13.5 E	.....	.....	0.7W	0.5W	.....	.....
5	25 39 N	218 44	13.3 E	.....	.....	13.4 E	13.2 E	.....	.....	0.1W	0.1 E	.....	.....
5	25 32 N	218 03	.....	46.0 N	.289	.....	.....	46.6 N	.289	.....	.....	0.6 S	0
5	25 30 N	217 52	12.9 E	.....	.....	13.3 E	13.0 E	.....	.....	0.4W	0.1W	.....	.....
6	25 18 N	216 31	12.8 E	.....	.....	13.2 E	12.9 E	.....	.....	0.4W	0.1W	.....	.....
6	25 14 N	215 57	.....	45.2 N	.287	.....	.....	46.0 N	.288	.....	.....	0.8 S	-1
6	25 13 N	215 49	12.7 E	.....	.....	13.1 E	12.8 E	.....	.....	0.4W	0.1W	.....	.....
7	25 09 N	214 59	12.3 E	.....	.....	13.0 E	12.7 E	.....	.....	0.7W	0.4W	.....	.....
7	24 56 N	214 20	.....	44.5 N	.288	.....	.....	45.3 N	.288	.....	.....	0.8 S	0
7	24 49 N	214 04	12.4 E	.....	.....	12.9 E	12.5 E	.....	.....	0.5W	0.1W	.....	.....
8	23 53 N	212 17	12.1 E	.....	.....	12.3 E	12.1 E	.....	.....	0.2W	0.0	.....	.....
8	23 36 N	211 35	.....	42.7 N	.290	.....	.....	43.4 N	.290	.....	.....	0.7 S	0
8	23 31 N	211 17	11.7 E	.....	.....	12.1 E	12.0 E	.....	.....	0.4W	0.3W	.....	.....
9	23 07 N	209 50	11.5 E	.....	.....	11.9 E	11.7 E	.....	.....	0.4W	0.2W	.....	.....
9	22 56 N	209 13	.....	41.7 N	.289	.....	.....	42.2 N	.290	.....	.....	0.5 S	-1
9	22 52 N	209 02	11.6 E	.....	.....	11.8 E	11.5 E	.....	.....	0.2W	0.1 E	.....	.....
10	22 22 N	207 29	11.5 E	.....	.....	11.4 E	11.3 E	.....	.....	0.1 E	0.2 E	.....	.....
10	22 12 N	206 48	.....	40.5 N	.289	.....	.....	41.1 N	.291	.....	.....	0.6 S	-2
10	22 09 N	206 32	11.3 E	.....	.....	11.3 E	11.1 E	.....	.....	0.0	0.2 E	.....	.....
11	21 52 N	204 52	11.1 E	.....	.....	11.0 E	10.9 E	.....	.....	0.1 E	0.2 E	.....	.....
11	21 40 N	203 58	.....	39.0 N	.292	.....	.....	40.1 N	.292	.....	.....	1.1 S	0
11	21 34 N	203 37	10.8 E	.....	.....	10.9 E	10.8 E	.....	.....	0.1W	0.0	.....	.....

NOTES ON THE TRIP FROM SAN FRANCISCO TO HONOLULU.

We left the dock at 4 P. M., and were towed out to the light-ship, where we dismissed the pilot and tugboat. The wind was favorable, enabling us to set our course direct for Honolulu.

During the entire passage observing conditions were good and permitted declination observations twice every day except on April 1, when cloudy weather prevented them. Winds were moderate to fresh and favorable all the way to Honolulu, and a following sea made the *Carnegie* roll heavily at times. On April 7 the wind died out, and a very heavy swell came from the north, indicating a storm of considerable force in that direction. The engine was operated until the breeze was picked up again in the course of three hours, more or less.

As we approached the Hawaiian Islands the wind became quite strong and a very heavy current from the south was found in Kaiwi Channel, between Molokai and Oahu Islands. We arrived off Honolulu Harbor early on April 12, and were alongside the

dock at 8^h 40^m. The distance traversed was 2,222 miles, giving an average of 151 miles per day for the 14.7 days of the trip.

The marked change and improvement in the methods, instruments, and equipment provided for ocean observations since the cruise of the *Galilee* sixteen years ago is extremely gratifying. The *Galilee* made the passage from San Diego to Honolulu in 12 days during the year 1905, covering much the same region as the *Carnegie* covered this time. Thirteen stations were occupied then as contrasted to 40 on the *Carnegie's* trip.

LETTERS TO EDITOR

MAGNETIC DISTURBANCES OF DECEMBER 4-5, 1920, AT CHELTENHAM OBSERVATORY, MARYLAND.¹

A magnetic disturbance with a sudden beginning in *H*, and a fairly well pronounced beginning in *D* and *Z*, began December 4, 1920, at 0^h 03^m, 75th meridian standard time, hence on December 4, at 5^h 03^m, G. M. T. *H* increased from the beginning of the disturbance until 0^h 30^m, the maximum for the day, and returned to its original value at about 1^h 54^m, the increase being 54 γ . *D* and *Z* were only slightly disturbed.

The period of the largest disturbances extended from 18^h to 19^h, there being a decrease in *D* of some 26', a decrease of 70 γ in *H*, and an increase of 17 γ in *Z*. The minimum in *D* occurred at 18^h 22^m; the minimum in *H* at 18^h 18^m; and the maximum in *Z* at 18^h 18^m. *H* was again rather violently disturbed from 14^h on December 5, to 17^h 30^m, with a range of some 60 γ . Except during the intervals stated, the curves were only slightly disturbed. The magnetic disturbance appears to have ended at about 24^h on December 5th.

GEORGE HARTNELL, *Observer-in-Charge*.

MAGNETIC DISTURBANCES DECEMBER 4-6, 1920, AT WATHEROO OBSERVATORY.

Captain Edward Kidson, at the time observer-in-charge at the Watheroo Observatory, reported that a magnetic disturbance commenced suddenly at 13^h 03^m (120th east meridian standard time) on December 4, 1920, and continued as a slight storm throughout December 5 and 6; movements were never very large, but were rapid during the morning of December 6.

¹Communicated by Col. E. Lester Jones, Director United States Coast and Geodetic Survey.