(Pearson, *Phil. Mag.*, 2, p. 157, "on the criterion that a given system of deviations from the probable . . . is such that it can be reasonably supposed to have arisen from random sampling"), we learn that only once in 500 samples would there arise a group so divergent as the stars of the galactic region from stars as a whole, and only once in 2500 samples would there arise a group so divergent as the non-galactic stars from stars as a whole. It is therefore unlikely that these groups are random samples. But the differentiation is not as great as one frequently finds in investigations of this kind. The two groups of stars are significantly different, but the difference* is not of that sweeping character which occurs, say, in the deviations between theory and observation in the colour runs of some roulette tables, where the differentiation is such that not one sample in 10^9 trials would deviate as much as observation does. It seemed worth while to reduce Mr. Franks' data to an estimate of this kind, because, while some stress must be laid on the colour differentiation between galactic and non-galactic stars, it is still not one of the kind which produces a sweeping conviction that it is of fundamental importance.

On the Orbit of Jupiter's Eighth Satellite. By P. H. Cowell, M.A., F.R.S., A. C. D. Crommelin, B.A., and C. Davidson. (Plate 16.)

In the *Monthly Notices* of last June an orbit was given for Jupiter's Eighth Satellite based upon the observations made within three months. Having been given the observed right ascensions and declinations, the problem was to deduce the geocentric distance and the motion in the line of sight. This was done with sufficient accuracy to assign the satellite's position for the next opposition to within four minutes of arc. Nevertheless, the error of geocentric distance was of such a magnitude that, if placed transverse to the line of sight, it would have subtended about one minute of arc. For an accurate orbit such an error is inadmissible; and hence it follows that the observations at any one opposition can only be considered as giving rise to four equations of condition, viz. observed right ascension and declination, and observed motion in these coordinates. The material at our disposal now amounts to eight observed quantities, viz. the above four at the oppositions of 1908 and 1909. When the conditions of the problem are assumed, there are only six arbitrary constants in the motion. An orbit, however, that satisfies the observed right ascension and declination in 1908 February, 1908 March, and 1909 January will be sure to satisfy the observed place in 1909 February, unless the

* It does not exceed the divergence given by ordinary dice, which are usually loaded, though not intentionally.

assumed conditions were in more serious error than is conceivable. We have assumed that the Sun supplies the sole disturbing force, and that its mass is 1047.35 times that of Jupiter, and that its position may be taken from the *Connaissance des Temps*. Before long, Jupiter's Eighth Satellite will afford the best determination of the mass of Jupiter, but the time for that has clearly not yet come.

We found it convenient to use equatorial coordinates for 1910.0 instead of ecliptic coordinates for 1908.0. We began, therefore, by transforming the orbit given in *Monthly Notices*, vol. lxviii. p. 576, to these new axes of reference, and we carried that orbit forward to 1909, with the result that a discordance of four minutes was disclosed by the first observation of 1909. We then investigated separately the effects of six independent variations of the initial conditions, with a view to determining the modification which was required. Each successive approximation diminished the error in 1909, and finally we determined the orbit exhibited in Table II., the errors of which do not exceed three seconds of arc. Until observations have been obtained in 1910, we do not think it necessary to go further. Greater accuracy will then be required, for the cumulative error of our calculation may well amount to one second of arc.

Table I. gives the Jovicentric coordinates of the Sun referred to the mean equator and equinox of 1910.0, and also the reversed attractions of the Sun on Jupiter.

Table II. gives the Jovicentric coordinates of the satellite referred to the same axes. A uniform interval of 16 days has been used in copying out for press, but 8-day intervals were used in the calculations from 1908 July 6 to 1909 January 30, the period during which the radius vector was less than 0.14.

In addition, it is only necessary to state that we have adopted

$$\log \frac{\text{mass of Sun} \times \text{square of 16 days}}{\text{cube of astronomical unit of length}} = 8.8794028.$$

$$\log \frac{\text{mass of Jupiter} \times \text{square of 16 days}}{\text{cube of astronomical unit of length}} = 5.8593110.$$

Table III. gives the coordinates of Table II. reduced to geocentric right ascension and declination, and interpolated to four-day intervals for the oppositions of 1908, 1909, and 1910.

Table IV. gives a comparison of tabular minus observed positions: the observed places of 1909 are not definitive. Better places will ultimately be obtained in the manner described in the *M.N.*, lxviii. p. 582.

TABLE I.

Jovicentric Coordinates of Sun and reversed Attractions of Sun on Jupiter in Eighth Decimal Place.

Paris, Noon. 1908.	Jovicentric Coordinates of Sun.			Reversed Attractions of Sun on Jupiter in Eighth Decimal Place		
	<i>x.</i>	<i>y.</i>	<i>z.</i>	<i>X.</i>	<i>Y.</i>	<i>Z.</i>
Jan. 28	+ 3'301 953	- 3'782 108	- 1'704 680	- 1 678 07	+ 1 922 08	+ 866 33
Feb. 13	3'396 903	3'716 341	1'678 776	1 721 24	1 883 10	850 65
29	3'490 135	3'648 687	1'652 017	1 763 35	1 843 45	834 66
Mar. 16	3'581 600	3'579 188	1'624 422	1 804 37	1 803 15	818 37
Apr. 1	3'671 260	3'507 884	1'596 009	1 844 31	1 762 23	801 78
17	3'759 077	3'434 815	1'566 791	1 883 16	1 720 71	784 90
May 3	3'845 009	3'360 023	1'536 791	1 920 91	1 678 62	767 76
19	3'929 008	3'283 556	1'506 022	1 957 57	1 635 98	750 35
June 4	4'011 057	3'205 446	1'474 509	1 993 12	1 592 81	732 69
20	4'091 111	3'125 748	1'442 247	2 027 58	1 549 14	714 79
July 6	4'169 135	3'044 499	1'409 279	2 060 93	1 504 99	696 65
22	4'245 100	2'961 736	1'375 607	2 093 19	1 460 38	678 29
Aug. 7	4'318 963	2'877 513	1'341 266	2 124 33	1 415 34	659 72
23	4'390 703	2'791 876	1'306 263	2 154 37	1 369 88	640 94
Sept. 8	4'460 283	2'704 872	1'270 616	2 183 30	1 324 03	621 96
24	4'527 681	2'616 543	1'234 344	2 211 12	1 277 81	602 80
Oct. 10	4'592 865	2'526 932	1'197 465	2 237 85	1 231 23	583 46
26	4'655 810	2'436 086	1'160 012	2 263 47	1 184 33	563 95
Nov. 11	4'716 494	2'344 053	1'121 989	2 287 98	1 137 11	544 28
27	4'774 881	2'250 885	1'083 424	2 311 40	1 089 60	524 46
Dec. 13	4'830 958	2'156 624	1'044 335	2 333 72	1 041 81	504 49
29	4'884 700	2'061 324	1'004 733	2 354 94	993 77	484 39
1909.						
Jan. 14	4'936 083	1'965 028	0'964 654	2 375 06	945 50	464 16
30	4'985 095	1'867 785	0'924 109	2 394 09	897 00	443 80
Feb. 15	5'031 706	1'769 641	0'883 117	2 412 03	848 31	423 34
Mar. 3	5'075 905	1'670 653	0'841 702	2 428 89	799 43	402 77
19	5'117 670	1'570 860	0'799 884	2 444 66	750 39	382 10
Apr. 4	5'156 989	1'470 324	0'757 686	2 459 35	701 19	361 34
20	5'193 847	1'369 078	0'715 124	2 472 96	651 86	340 49
May 6	5'228 234	1'267 180	0'672 221	2 485 50	602 42	319 57
22	5'260 128	1'164 680	0'628 999	2 496 96	552 87	298 58
June 7	5'289 525	1'061 629	0'585 476	2 507 35	503 24	277 53
23	+ 5'316 411	- 0'958 068	- 0'541 678	- 2 516 68	+ 453 53	+ 256 42

TABLE I.—*continued.*

Paris, Noon. 1909.	Jovicentric Coordinates of Sun.			Reversed Attractions of Sun on Jupiter in Eighth Decimal Place.		
	<i>x.</i>	<i>y.</i>	<i>z.</i>	<i>X.</i>	<i>Y.</i>	<i>Z.</i>
July 9	+ 5'340 781	- 0'854 062	- 0'497 624	- 2 524 95	+ 403 77	+ 235 26
25	5'362 621	0'749 646	0'453 330	2 532 16	353 97	214 06
Aug. 10	5'381 929	0'644 875	0'408 827	2 538 32	304 15	192 82
26	5'398 693	0'539 805	0'364 127	2 543 42	254 31	171 55
Sept. 11	5'412 914	0'434 476	0'319 259	2 547 47	204 48	150 25
27	5'424 585	0'328 942	0'274 237	2 550 48	154 66	128 94
Oct. 13	5'433 702	0'223 255	0'229 088	2 552 45	104 87	107 61
29	5'440 270	0'117 466	0'183 832	2 553 39	55 13	86 28
Nov. 14	5'444 275	- 0'011 615	0'138 489	2 553 28	+ 5 45	64 95
30	5'445 727	+ 0'094 234	0'093 080	2 552 15	- 44 16	43 62
Dec. 16	5'444 627	0'200 041	0'047 629	2 549 99	93 69	22 31
1910.						
Jan. 1	5'440 972	0'305 757	- 0'002 155	2 546 80	143 12 +	1 01
17	5'434 771	0'411 331	+ 0'043 322	2 542 60	192 44 -	20 27
Feb. 2	5'426 023	0'516 709	0'088 780	2 537 38	241 63	41 52
18	5'414 732	0'621 853	0'134 194	2 531 15	290 69	62 73
Mar. 6	5'400 915	0'726 702	0'179 546	2 523 91	339 60	83 90
22	5'384 565	0'831 210	0'224 814	2 515 66	388 34	105 03
Apr. 7	5'365 699	0'935 328	0'269 977	2 506 40	436 91	126 11
23	5'344 326	1'039 014	0'315 013	2 496 15	485 29	147 13
May 9	5'320 454	1'142 204	0'359 901	2 484 90	533 46	168 09
25	+ 5'294 093	+ 1'244 873	+ 0'404 624	- 2 472 66	- 581 43	- 188 98

TABLE II.

*Jovicentric Coordinates of Jupiter's Eighth Satellite
to Seven Decimal Places.*

Paris, Noon. 1908.	<i>x.</i>	<i>y.</i>	<i>z.</i>
Jan. 28	+ '112 0131	- '123 6476	- '111 5381
Feb. 13	+ '098 2099	- '132 0784	- '106 1080
29	+ '083 6040	- '139 3770	- '099 6940
Mar. 16	+ '068 2740	- '145 3440	- '092 2760
Apr. 1	+ '052 3172	- '149 7601	- '083 8415
17	+ '035 8551	- '152 3850	- '074 3889
May 3	+ '019 0409	- '152 9563	- '063 9318
19	+ '002 0693	- '151 1891	- '052 5055
June 4	- '014 8100	- '146 7772	- '040 1764
20	- '031 2737	- '139 3980	- '027 0554

TABLE II.—*continued.*

Paris, Noon. 1908.	<i>x.</i>	<i>y.</i>	<i>z.</i>
July 6	− '046 9013	− '128 7255	− '013 3174
22	− '061 1462	− '114 4571	+ '000 7707
Aug. 7	− '073 3070	− '096 3681	+ '014 8137
23	− '082 5134	− '074 4091	+ '028 2468
Sept. 8	− '087 7618	− '048 8581	+ '040 3079
24	− '088 0547	− '020 5104	+ '050 0665
Oct. 10	− '082 6833	+ '009 1957	+ '056 5661
26	− '071 5793	+ '038 2946	+ '059 0944
Nov. 11	− '055 4964	+ '064 7421	+ '057 4528
27	− '035 8195	+ '086 9761	+ '052 0212
Dec. 13	− '014 1195	+ '104 2112	+ '043 5663
29	+ '008 2309	+ '116 3588	+ '032 9638
1909.			
Jan. 14	+ '030 2153	+ '123 7656	+ '021 0049
30	+ '051 1624	+ '126 9693	+ '008 3227
Feb. 15	+ '070 6654	+ '126 5483	− '004 6077
Mar. 3	+ '088 4990	+ '123 0481	− '017 4401
19	+ '104 5554	+ '116 9555	− '029 9249
Apr. 4	+ '118 8008	+ '108 6948	− '041 8823
20	+ '131 2466	+ '098 6336	− '053 1821
May 6	+ '141 9318	+ '087 0914	− '063 7295
22	+ '150 9113	+ '074 3479	− '073 4556
June 7	+ '158 2492	+ '060 6505	− '082 3102
23	+ '164 0141	+ '046 2198	− '090 2575
July 9	+ '168 2765	+ '031 2546	− '097 2724
25	+ '171 1064	+ '015 9355	− '103 3385
Aug. 10	+ '172 5724	+ '000 4277	− '108 4463
26	+ '172 7408	− '015 1169	− '112 5919
Sept. 11	+ '171 6746	− '030 5577	− '115 7757
27	+ '169 4337	− '045 7639	− '118 0023
Oct. 13	+ '166 0739	− '060 6130	− '119 2789
29	+ '161 6474	− '074 9898	− '119 6155
Nov. 14	+ '156 2023	− '088 7851	− '119 0238
30	+ '149 7830	− '101 8943	− '117 5172
Dec. 16	+ '142 4306	− '114 2160	− '115 1105
1910.			
Jan. 1	+ '134 1831	− '125 6506	− '111 8194
17	+ '125 0762	− '136 0995	− '107 6605

TABLE II.—*continued.*

Paris, Noon. 1908.		<i>x.</i>	<i>y.</i>	<i>z.</i>
Feb. 2		+ '115 1440	− '145 4625	− '102 6514
18		+ '104 4200	+ '153 6363	− '096 8105
Mar. 6		+ '092 9387	− '160 5122	− '090 1578
22		+ '080 7376	− '165 9736	− '082 7151
Apr. 7		+ '067 8594	− '169 8929	− '074 5072
23		+ '054 3558	− '172 1283	− '065 5630
May 9		+ '040 2915	− '172 5195	− '055 9181
25		+ '025 751	− '170 883	− '045 618

TABLE III.

Ephemeris of Jupiter's Eighth Satellite (VIII – 4).

Paris Noon.

1908.		R.A.		Diff.	Dec.		Diff.
		m	s	s	'	"	'
Jan. 28		− 0	7'22		− 43	9'4	
Feb. 1		+	1'26	+ 8'48	− 41	52'4	+ 1 17'0
5		+	9'78	+ 8'52	− 40	30'8	+ 1 21'6
9		+	18'39	+ 8'61	− 39	5'2	+ 1 25'6
13		+	27'12	+ 8'73	− 37	36'4	+ 1 28'8
17		+	35'99	+ 8'87	− 36	5'0	+ 1 31'4
21		+	45'03	+ 9'04	− 34	31'8	+ 1 33'2
25		+	54'23	+ 9'20	− 32	57'4	+ 1 34'4
29		+	63'61	+ 9'38	− 31	22'5	+ 1 34'9
Mar. 4		+	73'16	+ 9'55	− 29	47'6	+ 1 34'9
8		+	82'86	+ 9'70	− 28	13'4	+ 1 34'2
12		+	92'71	+ 9'85	− 26	40'4	+ 1 33'0
16		+	1 42'68	+ 9'97	− 25	8'9	+ 1 31'5
20		+	1 52'75	+ 10'07	− 23	39'4	+ 1 29'5
24		+	2 2'90	+ 10'15	− 22	12'3	+ 1 27'1
28		+	2 13'09	+ 10'19	− 20	47'8	+ 1 24'5
Apr. 1		+	2 23'28	+ 10'19	− 19	26'0	+ 1 21'8
5		+	2 33'44	+ 10'16	− 18	7'2	+ 1 18'8
9		+	2 43'54	+ 10'10	− 16	51'5	+ 1 15'7
				+ 9'99			+ 1 12'5

TABLE III.—*continued.*

	R.A.	Diff.	Dec.	Diff.
1908.	m s	s	' "	' "
Apr. 13	+ 2 53'53		- 15' 39"0	' "
17	+ 3 3'37	+ 9'84	- 14 29'6	+ 1 9'4
21	+ 3 13'03	+ 9'66	- 13 23'4	+ 1 6'2
25	+ 3 22'47	+ 9'44	- 12 20'3	+ 1 3'1
29	+ 3 31'66	+ 9'19	- 11 20'3	+ 1 0'0
May 3	+ 3 40'56	+ 8'90	- 10 23'4	+ 0 6'9

Ephemeris of Jupiter's Eighth Satellite (VIII - 4).
Paris Noon.

	R.A.	Diff.	Dec.	Diff.
1909.	m s	s	' "	' "
Jan. 2	- 5 35'50	- 14'12	+ 19 29'9	- 1 20'2
6	- 5 49'01	- 13'51	+ 18 3'9	- 1 26'0
10	- 6 1'88	- 12'87	+ 16 32'1	- 1 31'8
14	- 6 14'09	- 12'21	+ 14 55'1	- 1 37'0
18	- 6 25'64	- 11'55	+ 13 13'2	- 1 41'9
22	- 6 36'49	- 10'85	+ 11 26'9	- 1 46'3
26	- 6 46'62	- 10'13	+ 9 36'8	- 1 50'1
30	- 6 56'00	- 9'38	+ 7 43'4	- 1 53'4
Feb. 3	- 7 4'63	- 8'63	+ 5 47'3	- 1 56'1
7	- 7 12'47	- 7'84	+ 3 49'2	- 1 58'1
11	- 7 19'49	- 7'02	+ 1 49'6	- 1 59'6
15	- 7 25'66	- 6'17	- 0 10'7	- 2 0'3
19	- 7 30'96	- 5'30	- 2 11'2	- 2 0'5
23	- 7 35'38	- 4'42	- 4 11'2	- 2 0'0
27	- 7 38'89	- 3'51	- 6 10'0	- 1 58'8
Mar. 3	- 7 41'48	- 2'59	- 8 7'2	- 1 57'2
7	- 7 43'13	- 1'65	- 10 2'1	- 1 54'9
11	- 7 43'86	- 0'73	- 11 54'2	- 1 52'1
15	- 7 43'65	+ 0'21	- 13 43'1	- 1 48'9
19	- 7 42'53	+ 1'12	- 15 28'4	- 1 45'3
23	- 7 40'49	+ 2'04	- 17 9'7	- 1 41'3
		+ 2'92		- 1 37'3

(30)

TABLE III.—*continued.*

	R.A.		Diff.	Dec.	Diff.
1909.	m	s	s		
Mar. 27	— 7	37'57		— 18 47"0	' "
			+ 3'78		— 1 33'0
31	— 7	33'79		— 20 20'0	— 1 28'7
			+ 4'59		
Apr. 4	— 7	29'20		— 21 48'7	— 1 24'2
			+ 5'38		
8	— 7	23'82		— 23 12'9	— 1 20'0
			+ 6'12		
12	— 7	17'70		— 24 32'9	— 1 15'7
			+ 6'83		
16	— 7	10'87		— 25 48'6	— 1 11'8
			+ 7'50		
20	— 7	3'37		— 27 0'4	— 1 7'9
			+ 8'12		
24	— 6	55'25		— 28 8'3	— 1 4'3
			+ 8'70		
28	— 6	46'55		— 29 12'6	— 1 1'0
			+ 9'24		
May 2	— 6	37'31		— 30 13'6	— 0 58'1
			+ 9'73		
6	— 6	27'58		— 31 11'7	— 0 55'4
			+ 10'19		
10	— 6	17'39		— 32 7'1	— 0 53'0
			+ 10'60		
14	— 6	6'79		— 33 0'1	— 0 51'1
			+ 10'99		
18	— 5	55'80		— 33 51'2	— 0 49'3
			+ 11'33		
22	— 5	44'47		— 34 40'5	

*Ephemeris of Jupiter's Eighth Satellite (VIII — 2).**Paris Noon.*

	R.A.		Diff.	Dec.	Diff.
1910.	m	s	s		
Jan. 17	+ 7	20'38		— 77 7'5	' "
			+ 10'73		+ 2'1
21	+ 7	31'11		— 77 5'4	+ 6'4
			+ 10'41		
25	+ 7	41'52		— 76 59'0	+ 10'7
			+ 10'07		
29	+ 7	51'59		— 76 48'3	+ 15'4
			+ 9'70		
Feb. 2	+ 8	1'29		— 76 32'9	+ 20'3
			+ 9'29		
6	+ 8	10'58		— 76 12'6	+ 25'4
			+ 8'84		
10	+ 8	19'42		— 75 47'2	+ 31'0
			+ 8'35		
14	+ 8	27'77		— 75 16'2	+ 36'7
			+ 7'81		
18	+ 8	35'58		— 74 39'5	+ 42'8
			+ 7'23		
22	+ 8	42'81		— 73 56'7	+ 49'1
			+ 6'61		
26	+ 8	49'42		— 73 7'6	+ 55'7
			+ 5'95		
Mar. 2	+ 8	55'37		— 72 11'9	+ 1 2'3
			+ 5'25		

TABLE III.—*continued.*

		R.A.		Diff.	Dec.		Diff.
1910.		m	s	s			"
Mar.	6	+	9 0'62		- 71 9'6		
	10	+	9 5'13	+ 4'51	- 70 0'4	+1 9'2	
	14	+	9 8'88	+ 3'75	- 68 44'4	+1 16'0	
	18	+	9 11'84	+ 2'96	- 67 21'6	+1 22'8	
	22	+	9 14'00	+ 2'16	- 65 52'1	+1 29'5	
	26	+	9 15'34	+ 1'34	- 64 16'0	+1 36'1	
	30	+	9 15'86	+ '52	- 62 33'7	+1 42'3	
Apr.	3	+	9 15'56	- '30	- 60 45'5	+1 48'2	
	7	+	9 14'46	- 1'10	- 58 52'0	+1 53'5	
	11	+	9 12'56	- 1'90	- 56 53'4	+1 58'6	
	15	+	9 9'91	- 2'65	- 54 50'5	+2 2'9	
	19	+	9 6'52	- 3'39	- 52 43'7	+2 6'8	
	23	+	9 2'44	- 4'08	- 50 33'7	+2 10'0	
	27	+	8 57'69	- 4'75	- 48 21'1	+2 12'6	
May	1	+	8 52'31	- 5'38	- 46 6'4	+2 14'7	
	5	+	8 46'36	- 5'95	- 43 50'2	+2 16'2	
	9	+	8 39'86	- 6'50	- 41 33'0	+2 17'2	
	13	+	8 32'86	- 7'00	- 39 15'3	+2 17'7	
	17	+	8 25'37	- 7'49	- 36 57'5	+2 17'8	
	21	+	8 17'45	- 7'92	- 34 40'0	+2 17'5	
	25	+	8 9'08	- 8'37	- 32 22'9	+2 17'1	

TABLE IV.

Observed Positions of Jupiter's Eighth Satellite.

1908.

Date & G.M.T.			Aberra- tion Time.	Apparent R.A.		Apparent Dec.	Sat. VIII. - Jupiter.		Tab. - Obs.	
							R.A.	Dec.	R.A.	Dec.
1908.	d	h m	m	h	m	s	m	s		
Jan.	27	12 41	35'8	8 45	51'86		+ 18	5 1'4	- 0	8'40 - 43 18'1 + 0'18 - 0'4
Feb.	1	11 52	35'8	8 43	20'67		18 17	36'3 + 0	2'08 41 41'8 + 0'22 - 1'1	
,,	3	10 27	35'9	8 42	21'90		18 22	25'7 0	6'26 41 4'9 + 0'16 + 1'4	
,,	3	11 28	35'9	8 42	20'52		18 22	34'7 0	6'26 41 1'3 + 0'25 - 1'4	
,,	22	10 57	36'6	8 33	35'41		19 5	49'8 0	48'27 33 58'9 + 0'07 + 1'0	
,,	23	8 34	36'6	8 33	13'98		19 7	37'6 0	50'20 33 36'4 + 0'21 - 0'2	
,,	24	12 25	36'6	8 32	47'37		19 9	51'3 0	53'04 33 9'9 + 0'04 + 0'6	

TABLE IV.—*continued.*

Date & G.M.T.	Aberra- tion Time.	Apparent R.A.	Apparent Dec.	Sat. VIII. — Jupiter.		Tab. — Obs.	
				R.A.	Dec.	R.A.	Dec.
1908. d h m	m	h m s	° ' "	m s	' "	s	"
Feb. 27 10 59	36.9	8 31 42.89	19 15' 18".1	0 59.83	32 0.4	+0.11	+0.9
„ 28 11 29	37.0	8 31 21.76	19 17 6.7	1 2.23	31 35.9	+0.12	+0.7
Mar. 3 9 44	37.3	8 30 6.62	19 23 36.5	1 11.72	30 4.6	-0.01	+2.8
„ 8 20 22	37.8	8 28 39.71	19 31 33.3	1 24.72	27 54.4	+0.19	+0.6
„ 23 7 36	39.3	8 26 37.40	19 45 44.0	2 1.12	22 27.1	0.00	-0.1
„ 27 8 54	39.7	8 26 32.33	19 47 53.5	2 11.24	21 0.6	+0.22	-0.5
„ 31 9 16	40.3	8 26 40.24	19 49 12.3	2 21.44	19 38.8	+0.25	+0.3
Apr. 1 16 51	40.4	8 26 45.80	19 49 25.8	2 25.08	19 14.0	-0.05	+1.9
„ 3 9 52	40.6	8 26 54.72	19 49 38.8	2 29.22	18 40.9	+0.16	+2.7
„ 24 9 44	43.4	8 31 43.33	19 41 8.9	3 20.92	12 28.8	+0.13	-0.6
„ 29 16 51	44.1	8 33 43.97	+19 35 49.2	+3 33.15	-11 10.2	+0.06	+0.3

The observations on March 3 and 23 were made at Heidelberg; those on March 8, April 1 and 29 at Lick.

The Greenwich observed places given above are definitive.

1909.

Date & G.M.T.	Aberra- tion Time.	Apparent R.A.	Apparent Dec.	Sat. VIII. — Jupiter.		Tab. — Obs.	
				R.A.	Dec.	R.A.	Dec.
1909. d h m	m	h m s	° ' "	m s	' "	s	"
Jan. 16 13 15	39.0	10 56 46.68	+7 40 45.6	-6 21.55	+13 53.0	+0.07	-1.8
„ 16 15 3	39.0	10 56 45.48	7 40 49.7	-6 21.85	+13 50.2	+0.15	-0.9
„ 19 13 32	38.7	10 55 59.28	7 44 18.7	-6 29.87	+12 32.9	-0.05	-0.2
Feb. 12 11 35	37.0	10 46 47.87	8 29 41.9	-7 22.01	+1 4.6	+0.17	+0.9
„ 13 11 29	37.0	10 46 19.79	8 32 4.1	-7 23.54	+0 34.0	+0.16	+1.6
„ 15 12 22	36.9	10 45 21.42	8 37 3.8	-7 26.65	-0 24.1	+0.30	-1.5
„ 17 11 26	36.8	10 44 24.50	8 41 54.1	-7 29.22	-1 23.3	+0.22	-1.6
„ 18 10 52	36.8	10 43 55.77	8 44 18.1	-7 30.53	-1 54.8	+0.29	+0.6
„ 20 11 17	36.7	10 42 56.42	8 49 24.4	-7 32.51	-2 53.7	-0.14	-1.1

The observed places given above are not definitive. They will presently be replaced by others reduced with greater refinement.

Although the errors of tabular place amount to three seconds of arc, we have thought it advisable to defer further modification of the orbit until after the observations of 1910 have been reduced.

In order to exhibit the more striking features of the orbit a diagram (Plate 16) has been prepared in which the orbit is projected on a plane from which it does not depart far during 1908. By the middle of 1910, however, the angular distance from this

ORBIT OF JUPITER'S EIGHTH SATELLITE.

plane is fully 5° . This is graphically represented in the diagram by means of the short arrows, the lengths of which indicate the amount the orbit is above the plane of the paper.

It will be seen that rather more than a complete sidereal revolution has been calculated. The curve is not re-entrant, the radius vector being 10 per cent. greater and the angular motion 20 per cent. less in 1910 March than in 1908 March. No exact mean period can for the present be named, but 730 days is probably very near the truth.

The satellite was at least distance ($\cdot 100$ astronomical unit) on 1908 Oct. 19, and at greatest distance ($\cdot 216$ astronomical unit) on 1909 Dec. 7, giving an anomalistic period of 828 days. Owing to evection this may differ considerably from the mean anomalistic month.

The dotted line shows the line of intersection of the orbit plane with the equator, to which it is inclined at an angle of about 35° . From 1908 July 21 to 1909 Feb. 9 the satellite is North of the equator; for the remainder of the time it is South.

The inscribed circle serves to indicate the points 0^h , 6^h , 12^h , and 18^h of Jovicentric R.A., and the direction of the Earth at the times of opposition in 1908, 1909, and 1910.

The dotted arcs show those parts of the orbit actually observed, and on which the whole orbit is based.

Occultations of Planets by the Moon in 1909, visible at British Observatories. By A. M. W. Downing, D.Sc., F.R.S.

The following particulars are computed for the exact positions of the observatories named, but they will also serve as predictions for places not very far distant from the observatories.

It is hoped that astronomers who are favourably placed will not fail to attempt the observation of these phenomena, and will note everything that strikes them in the appearance of the planet under observation, whilst not neglecting to record the times of the various phases of the occultation.

Place.	Planet.	Phase.	Standard Time of Place.			Angle from North Point. Vertex	
			d	h	m	$^{\circ}$	$^{\circ}$
Ottawa	Mars	{ Immersion	Sept.	1	9 1	67	110
		{ Emersion	,,	1	9 59	237	276
Sydney	Venus	{ Immersion	Nov.	17	1 45	160	282
		{ Emersion	,,	17	2 28	208	356

1909 March 8.