



5.6. Geometry of the vicarious orbit solution, from the *Astronomia nova*. *a*, *b*, and *c* on the line of apsides *hi* represent the Sun, the centre of the orbit, and the equant point respectively; *d*, *e*, *f*, and *g* represent the four opposition positions of Mars.

Table 5.3 *Martian longitudes from the vicarious hypothesis*

Time of opposition	Predicted			Observed			Difference				
	d	h	m	°	'	"		°	'	"	'
1580 Nov	18	1	31	66	28	44	66	28	35	0	9
1582 Dec	28	3	58	106	57	4	106	55	30	1	34
1585 Jan	30	19	14	141	37	46	141	36	10	1	36
1587 Mar	6	7	23	175	43	16	175	43	0	0	16
1589 Apr	14	6	23	214	26	12	214	24	0	2	12
1591 Jun	8	7	43	266	43	51	266	43	0	0	51
1593 Aug	25	17	27	342	16	42	342	16	0	0	42
1595 Oct	31	0	39	47	31	54	47	31	40	0	14
1597 Dec	13	15	44	92	28	3	92	28	0	0	3
1600 Jan	18	14	2	128	38	18	128	38	0	0	18
1602 Feb	20	14	13	162	25	13	162	27	0	-1	47
1604 Mar	28	16	23	198	36	43	198	37	10	-0	27

Kepler's Final Remarks in Chapter 20 Concerning the Falsity of his Vicarious Hypothesis

The blame for this discrepancy among the different ways of finding the eccentricity (I am repeating this over and over so that it will be remembered) falls entirely upon the faulty assumption studiously entertained by me, in common with Tycho and all who have ever devised hypotheses. For the necessary consequence of this enquiry is that there is no single fixed point on the planet's eccentric about which the planet always sweeps out equal angles in equal times. We would instead have to make such a point reciprocate up and down along the line of apsides – if, indeed, we can keep the other assumption of a circular orbit. And how such a reciprocation could be reconciled with natural principles, I do not see.

But in fact the other assumption will be demolished, in chapter 44 below; that is, the orbit of the star is not a perfect circle, but an oval, and its greatest diameter is the line of apsides, while its least is that passing through the centre to the middle longitudes. No wonder, then, that the other observations at points not at opposition to the sun do not accord with the hypothesis constructed in chapter 16, since in it we have made two false assumptions.