

the discovery of Pallas by Olbers, aptly criticised the so-called law of distances in a letter to Zach (October, 1802). "The statement of Titius," says he, "contrary to the nature of all truths which merit the name of laws, agrees only approximatively with observed facts in the case of most planets, and, what does not appear to have been once observed, not at all in the case of Mercury. It is evident that the series

$$4, 4+3, 4+6, 4+12, 4+48, 4+96, 4+192,$$

with which the distances should correspond, is not a continuous series at all. The member which precedes  $4+3$  should not be 4; *i. e.*,  $4+0$ , but  $4+1\frac{1}{2}$ . Therefore, between 4 and  $4+3$ , there should be an infinite number; or, as Wurm expresses it, for  $n=1$ , there is obtained from  $4+2^{n-2}.3$ , not 4, but  $5\frac{1}{2}$ . Otherwise, the attempt to discover such approximative similarities in nature is by no means to be censured."

5. *Masses of the Planets.*—These elements are determined by satellites when there are any, by the mutual disturbances of the principal planets among each other, or by the influence of a comet of brief revolution. In this way the hitherto unknown mass of Mercury was determined by Encke in 1841, by the disturbances which his comet suffered. The same comet offers a prospect of a future improvement in the estimation of the mass of Venus. The disturbances of Vesta are applied to Jupiter. The mass of the Sun being taken as unity, those of the planets are (according to Encke, *vierte Abhandlung über den Cometen von Pons in den Schriften der Berliner Akademie der Wissenschaften* for 1842, p. 5).

Mercury . . . . .	$\frac{1}{4865751}$
Venus . . . . .	$\frac{1}{401839}$
Earth . . . . .	$\frac{1}{35951}$

numbers which Kepler considered, in accordance with the Tychonic system, to be the true ones. I quote the latter from Newton's work *De Mundi Systemate* (*Opuscula Math. Philos. et Philol.*, 1744, tom. ii., p. 22):

Planets.	Actual Distances.	Kepler's Results.
Mercury . . . . .	0.38709	0.38806
Venus . . . . .	0.72333	0.72400
Earth . . . . .	1.00000	1.00000
Mars . . . . .	1.52369	1.52350
Juno . . . . .	2.66870	
Jupiter . . . . .	5.20277	5.19650
Saturn . . . . .	9.53885	9.51000
Uranus . . . . .	19.18239	
Neptune . . . . .	30.03628	