

GAUSS TO OLBERS

Brunswick

April 20, 1802

Translated from the German by Michael Kirsch and Peter Martinson

My most heartfelt thanks for both of your most respected letters from the 13th and the 18th, and the observations of your Pallas, which is becoming more remarkable to me each day. Do continue to communicate these observations to me.

Soon after receiving your first observations, I made an attempt to place a circle through the positions of March 29th and April 1st, and had the same fate as you, in finding the motion always to be too fast. It was going like this for me when I obtained the observations of von Zach on the 14th for the 4th, 5th, and 7th of April, and then wanted to combine them with yours from the 29th. According to my method, I attempted to determine the conic section through the observations of March 29th and the 4th and 7th of April, independent of the hypotheses and found immediately that this is impossible, since these observations are too close. Therefore, I felt it best to let the matter rest for the time being, and to first await further observations. Perhaps I would have attempted this anew following the receipt of your last letter (from April 17th), if a few accidental impediments had not hindered me. However, since I obtained your observations yesterday evening, I could no longer resist.

I chose your observations from March 29th, Von Zach's from April 7th, and the mean of your two last from April 17th (conceivably, the irregularities of motion in a few of the times [contribute] *absolutely nothing* toward the possible errors of observation), and immediately found, *with the first attempt*, the following elements, which however I present *only to you*, as a sign of my warm respect and the extraordinary interest which I take in your eternally remarkable discovery. Indeed I hope not to have been hasty in the calculations; however the influence of the smallest change of observations is yet so big, that the true elements could be fairly different than the following. Meanwhile almost every day brings us closer to the truth, and I hope to be able to send your soon improved results to an agreeable disposition.

ELEMENTS OF *Pallas*

The orbit of a rectangular ellipse.

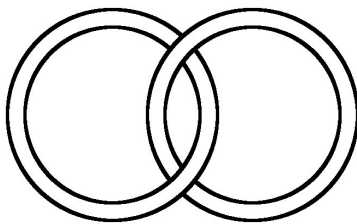
Epoch March 31, 1802, Noon				
<i>Seeburg</i> Meridian.....		153° 24' 14"		
Daily (sidereal) Motion.....		673.33"		
Logarithm of the Semi-Axis Major...	0.4811840		Semi-Axis itself = 3.0282	
Eccentricity.....		0.334920"		
Aphelion.....		295° 40' 33"		
Inclination.....		37° 24' 52"		
Longitude of the Ascending Node.....		173° 15' 43"		

Your pair of outer observations become almost exactly represented through these elements, although not yet taking parallax and aberration into consideration. Now, I have calculated the three observations of von Zach according to these elements and found:

		Longitude	Error	Latitude	Error
Apr.	4 th	177° 45' 49.9"	-12.4"	14° 13' 29.5"	-7.5"
"	5 th	177° 29' 8.9"	-10.9"	26' 30.9"	-7.3"
"	7 th	176° 56' 51.6"	-13.2"	51' 38.6"	-2.3"

Tommorrow I hope to receive further observations from Von Zach.

With the great uncertainty which must now rest upon these elements, one should still reasonably refrain from all the deductions. However, if this calculated orbit is not entirely different from the truth, then its position with respect to the orbit of Ceres is one of the most remarkable phenomena in our heavens. Both of these orbits are linked with one another, as I can make sensible [apparent] in the fastest way with this figure, and both of the orbits come frightfully close together at one place, not far from the region where both of the stars are now. Perhaps our most distant descendents at some future time could be spectators of a magnificent horrible phenomenon, the collisions of two celestial bodies! Happily, this time they pass by one another. —Yet this is currently just a dream, which will perhaps already be destroyed in 14 days with a better knowledge of the orbit.



Should the forgoing elements be similar to the truth, which is certainly possible after all, then one would well have no misgivings in continuing to call *Pallas* a planet. Indeed, the greatest distance from the Sun is twice as big as the smallest, though for *Mercury* it is in fact 3:2, and the orbit of *Pallas* would differ very little a circle, but not with the position of the Sun in the middle.

However, would the known excellent, recently brought into vogue law of Bode, which *Ceres* beautifully appeared to confirm, be destroyed at once? —On that, it would absolutely not be surprising to me. I have, speaking in confidence, never given much to that, and must communicate an observation to you, of which I have already been *in petto* [in pursuit] for 12 years, and am thereby amazed that it had not been [pursued] long ago. It is briefly this:

The series

$$4, \quad 4+3, \quad 4+6, \quad 4+12, \quad 4+24, \\ 4+48, \quad 4+96, \quad 4+192$$

is not a continuous series. To see this, it needs only to be noted that $4+3$ should be preceded by, not 4, but $4+1\frac{1}{2}$, so that *Mercury* is not passed over in the series, or that there should not yet be an infinite number of planets between *Mercury* and *Venus*. One should do well not to expect this. I would like to hear your opinion.

P.S. Seyffer is immensely excited about your letter, he truly commends you. He also has begun to observe *Pallas*.