On a New Primary Planet of our Solar System, Long Suspected Between Mars and Jupiter, Now Possibly Discovered

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That a special planet of our Solar System must still exist between Mars and Jupiter which, because of its weak light and its small magnitude, could not be found until now, had, to our knowledge, already been first suspected 40 years ago by the immortal Lambert, at least first publicly uttered. In his "Cosmological Letters on the Construction of the Universe," which appeared in 1761 in Augsburg, right at the end of the first letter, p. 7, this noteworthy passage occurs: and who knows whether a mangled planet came from the wide space that is between Mars and Jupiter. Lambert was most likely conducted to the thoughts through the comparison of various distances of the planets from one another, and he must at that time have already found that the space from Mars to Jupiter is suddenly quite incomparably large. In order to fill this gap, he puts a primary planet in, and since this hadn't become visible in 2 centuries, that is, since the discovery of telescopes, so he left it again for a bellicose comet snatched away from the mighty power of the sun, and carries on as a satellite in the immeasurable space. And, he closes with the remark: Does this hold in the celestial orb as on the Earth, that the stronger rubs out the weaker, and are Jupiter and Saturn determined only to that purpose, to always got the booty?

What the astronomers could further confirm on the existence of such a planet, was a known relationship, observed between the distances to the Sun of the hitherto known 6 primary planets, a relationship which was confirmed by Dr. Herschel in 1781 through the 7th located primary planet Uranus, beyond the orbit of Saturn. Prof. Bode had made first confession of this remarkable relationship in 1772, in the 2nd edition of his "Introduction to the Knowledge of the Bespeckled Heavens." In order to represent these rough and small numbers, which themselves are easily overlooked, one partitions the interval between Saturn and the Sun into 100 equal pieces thus: [table]

Or expressed generally, the distance of the nth planet from the sun is calculated with 4+(2n-2x3). Or, as Prof. Wurm has done, the mean distance of the first planet is expressed by *a*, the difference between the distances of the first and second with *b*, the mean distance of the Earth from the Sun =1: thus, each nth planet's mean distance from the Sun =a+(2n-2xb).

This law is based on no theory known to us, at least, until now, it cannot be proven mathematically, and it has merely been empirically deduced by *analogy*. In no other science has the human sprit - purely through mathematical logic, and through sharpness of geometrical meditations - brought out more, surer, and purer truths, than in Astronomy. If on considers the magnitude and sublimeness of the object, with which this science occupies itself, and looks at the tininess of Man and of his home; if one considers the immeasurable variety and connection between heavenly appearances, all of which will be deduced from one single, very simple law of nature that reaches through the whole area of Creation, the law of universal Gravitation; if one considers which profound mathematical methods and analytical techniques must be found to design the calculation of all these manifold combined appearances, and to accomplish a certain perpetual agreement of the calculations with the real events of the sky - thus must the layman profess, as the initiate certainly does, that no science does more to honor the human sprit, that in no science have so many discoveries been made a priori, and that no science grounds itself on unalterable proofs, as the sublime Astronomy.[1]

[1] LaPlace, this (also out of his *Analyse*) profound-thinking spirit, says from there about the progress of the new chemistry, in the preface to his unusual work *Theory of the Movement and of the Elliptical Figure of the Planets* (1784), p. xij, the following noteworthy words: "and it will not be [at the moment] where the law of chemical attraction will be sufficiently observed,

That is why the *mathematical* astronomers [(however, there are exceptions to this)] do not lightly assume something for agreement [ausgemacht], which cannot be mathematically proven. However, though the probability was so great, that the reported relationship of the planetary intervals, at least as nearness to the truth could be found in the natural state, yet there were astronomers who doubted the conclusions of this [?unreadable word?] law, and, consequently, the existence of an unseen planet to be found between Mars and Jupiter.

It will always remain characteristic and remarkable that, to our knowledge, there had been no astronomers from any nation, besides the *Germans*, who had taken up this *suspicion* in their textbooks, or had written on this subject. How can this be explained? The sprit of a great German man absolutely ought to rest on the Germans, the spirit of a *Kepler*! Not as if the Germans *necessarily* had believed in the existence of such a planet, or had announced it as proven. Prof. *Bode* mentions this planet in all of his assessable textbooks, and in all of his numerous editions, since 1772, but he always speaks of its existence only as *suspicion*, as *analogy*, and not as proven truth.

For already 16 years I concerned myself with the measurement of analogical elements of the orbit of this [dating ?datirenden?] planet, as one can see from a letter reproduced in the *Berlin Astronomical Yearbook* (1789), p. 182, 183, which I wrote in 1785 to Professor *Bode* in Dresden. I explained [myself] these investigations as "wool-gathering" (musings), and called my calculations *chimerical*; jokingly I compared it with the pains of the alchemists who search for gold. During *LaLande's* presence in Gotha, as I had the pleasure to see my highly valued friend *Bode* again, we also came to speak on this subject. The venerable elder of astronomers [LaLande] had no strong thoughts on this planet, also he made mention of it with no syllable in the three editions of his *Astronomie*, and I took to calling those who had strong beliefs upon it, *astronomical alchemists*.

Prof. *Wurm* occupied himself with similar thoughts in the year 1787 on *possible planets and comets of our Solar System*, which ideal he wrote up in the *Berlin Astronomical Yearbook*, 1780, p. 167, and gave further details in the following volume, p. 188, also expanding on the arrangement of the system of satellites. However, he also remarks besides, that his astronomical *vision* is far distant, which is expressly why he explained his investigations, [rather than forcing it upon anyone as true – *jemanden für wahr aufdringen zu wollen*].

One has reason to be all the more on his guard with analogical conclusions, for the noteworthy example of our great masters must serve as a warning to us, tha noe should not trust an over active imagination too much. One can probably allow poets their play, but one myst [blame – *verargen*] a known kind of natural scientist who intends to catch Nature on the black ice of mysticism, displace a generally understandable language with an incomprehensible art-*jargon*, and wants to explain [*some latin phrase – observam per objearius?*]. After all, these men, however, themselves as enemies of their opinion, point to the idea-poor and unfruitful mathematics, which the above quoted place of a *LaPlace* probably takes to heart, it were then, that they rank this great man also under the *unpoetic, unaesthetic,* and *unphilosophical* heads, upon which they look down with sympathy.[2]

Kepler, who often amused himself with similar astronomical woolgathering, and allowed his fiery imagination an unrestrained course, believed himself to have made a very important discovery: that the five regular solids pass in the space betewwn the six planetary orbits known at that time. And, according to new observations, agree very well with this law. But unfortunately! (remarked Prof. *Wurm*) *Euclid and Nature leaves Uranus with no regular solid*, and, in addition, I submit that also no more remain for *Hera*[3], and with that, Kepler's *ingenious Ideal* became, all at once, totally nullified.

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for applying the analysis there that this science (chemistry) will have the degree of perfection as that of Astronomy, which itself is elevated from through the discovery of Universal Gravitation."

[2] Which concept of the higher analysis do these men like to have? They keep it [analysis] for a *calculation*, and believe, perhaps, *LaPlace* had, e.g., reckoned the true *cause* of secular equations without spirit, quite *mechanistically* according to a Rule of Three. *It is calculation all the same!* It is, after all, a beautiful calculation, which reckons not only *quantities*, but also *causes*. This, as only well meaning advice for *young* prospective natural scientists, not to neglect the study of mathematics. The old system is [utopian – *Schwärmer*] and can no longer be changed. They think, one calculates where there is nothing to calculate

[3] The early name for the asteroid Ceres.

One could indeed raise the same question here, which had been raised with the occasion of the discovery of *Uranus*, why this planet [Ceres] had not already been discovered long ago; however again Hofrath *Lichtenberg*[4] gave an answer, [in the form of] the question, which he found not much more sensible, of *Lelio*'s servant, in *Lessing*'s treasure, who really wanted to know, why the father of his Lord returned exactly today, and not a year earlier or later, which would have been more understandable to him.

As Prof. *Bode* had also done in his *Commentary on Astronomy*, it is probably most natural to suppose that this planet is smaller than Mars, and, from its already considerable distance behind [Mars], casts out too little light from its surface, on account of which it has hitherto eluded our sharpened eyes. Who knows of what quality its surface is? We know heavenly bodies that twincle between color shades of red and green, as e.g. Mars, and the double star □ in Andromeda, who's light decreases and increases, and even competely disappears before our eagle eyes.

Kant and *Wünsch*, in their cosmological papers, hold that this planet does not exist for them, but was incorporated into Jupiter, who is thense also so much bigger than it should be according to the probable law, thence, as it were, it represented the place of two planets. *Kant* ascribed the smallness of Mars and its lack of satellites to the same cause. Only, one absolutely does not require this hypothesis to explain the hitherto existing invisibility of this planet. One knows this much more naturally, and makes the natural law more suitable. How long did Uranus remain hidden to our eyes? and after all, it stands but in the heavens, but, as we know *now*, even 20, 30, and 90 years before *Herschel*'s discovery of the same, it was seen and measured by French, German, and English astronomers. How could Prof. *Wünsch*, thence, in the second edition of his *Cosmological Conversations if 1791*, only *ten* years after the discovery of Uranus, still make the remark: *What kind of body must that have been, which one could not find in such proximity through even the best telescope, notwithstanding that almost every night, every tiny speck of the heavens was examined with the greatest dilligence?* Only, should this planet [Ceres] once become discovered, or really already be discovered, so will it become surely very comprehensible, why this planet, appearing telesopically as a star, could keep itself hidden for so long under the countless multitude of these stars. P. *Wünsch* thinks that, through the best telescopes, one can see the satellites of Saturn and Uranus, which however shine only with a pale reflection, so this hidden planet had probably been also able to be seen. But Prof. *Wünsch* did not consider that it is something completely different, to seek out a certain, extremely small, moveable point of light, itself distinguished through nothing, changing its place *somewhere* in immeasurable space, [something other] to spy up a satellite, not alsways only in the proximity of its primary planet, but must be found in the field of a spy's scope. As Prof. *W.* is a good mathematician, he calculated the degree of probability of the discovery of such a satellite – or planet. It is possible, that this planet, so like Uranus, already will have been seen; it is also possible, however, that it is *not always* apparent. Then, if it e.g. shows itself in its greatest perigee only as a telescopic star, then it could certainly be snatched away from our most powerful telescopes in its greatest distance from the Earth, and completely disappear, which makes the difficulty of its discovery yet greater, [and more sugject to chance.]

All of these obstacles probably could have been partly foreseen, and it was only possible through *chance*, or through a *systematic arrangement*, to locate these planets under the countless set of telescopic stars. In 1787, as I carried out a new revision of the stars of the heavens in Gotha, so the search for this planet had already been my intention, [for which the most serene founder of the Uranus-Temple of gotha encouraged me excellently]. To push this hidden planet [into view], I limited myself only to the stars of the Zodiac, and produced my zodiacal star catalogue in right asenscion, that it were, according to plan, likely to be only on this path.

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[4] Georg Christoph Lichtenberg (1 July 1742 – 24 February 1799) was professor of Physics at Göttingen Universität from 1769 until his death. He was one of Karl Gauss' teachers, one of the first scientists to introduce experiments with apparatus in their lectures, and made some of the pioneering discoveries in plasma physics. He was also one of the first in Germany to begin using Ben Franklin's lightning rods.