

MONTHLY CORRESPONDENCE

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On a
NEW PRIMARY PLANET
of our Solar System

long suspected to be between Mars and Jupiter
and now Possibly Discovered

To our knowledge, the idea that a special planet of our Solar System must yet exist between Mars and Jupiter, which could not be found until now because of its weak light and small magnitude, had been first suspected, or at least first publicly mentioned, 40 years ago by the immortal LAMBERT. In his *Cosmological Letters on the Arrangement 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 these 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. To fill this gap, he inserted a primary planet, but since this hadn't become visible in two centuries, that is, since the discovery of telescopes, he left it as a bellicose comet snatched away from the mighty power of the Sun, and which carries on as a satellite in immeasurable space. And, he closes with the remark: *Does it hold in the celestial orb as on the Earth, that the stronger destroys the weaker, and thus Jupiter and Saturn are eternally conducted by this purpose, to always loot and plunder?*

What astronomers of this opinion, that such a planet exists, could further rely on, was a known relationship observed between the distances of the hitherto known 6 primary planets to the Sun, 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 statement 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, the interval between Saturn and the Sun is partitioned into 100 equal parts thus:

- 1) Mercury..... 4 such parts of the SUN distance
- 2) Venus..... 4 + 3 = 7
- 3) Earth..... 4 + 2 · 3 = 10
- 4) Mars..... 4 + 2 · 2 · 3 = 16
- 5) Hera or Juno 4 + 2 · 2 · 2 · 3 = 28
- 6) Jupiter..... 4 + 2 · 2 · 2 · 2 · 3 = 52
- 7) Saturn..... 4 + 2 · 2 · 2 · 2 · 2 · 3 = 100
- 8) Uranus..... 4 + 2 · 2 · 2 · 2 · 2 · 2 · 3 = 196
- etc..... etc.....etc....

Or expressed generally, the distance of the n^{th} planet from the Sun is calculated with $4 + (2^{n-2} \cdot 3)$. Or, as Prof. WURM has done,¹ 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 n^{th} planet's mean distance from the Sun = $a + (2^{n-2} \cdot b)$.

This law is based on no theory known to us, at least, to the present, 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 one considers the magnitude and sublimity 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 what 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 professes, that no other science does more to honor the human sprit, that in no other science have so many discoveries been made *a priori*, and that no other science grounds itself on unalterable proofs, than the sublime Astronomy.²

That is why the *mathematical* astronomers do not lightly assume something, for the sake of agreement, that cannot be mathematically proven (of course, there are exceptions to this). However, though the probability was so great, that the reported relationship of the planetary intervals could be found in Nature, at least in close approximation, there were still astronomers who doubted the conclusions of this *unproven* law, and, consequently, doubted the existence of an unseen planet to be found between Mars and Jupiter.

¹*Berlin Astronomical Yearbook*, 1790, p. 168

²LAPLACE, who is a profound thinking spirit outside of his *Analysis*, says 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 only be when the law of chemical attraction will be observed sufficiently to apply analysis to it, that this science (chemistry) will attain the degree of perfection that Astronomy has, which itself was elevated through the discovery of universal gravitation*

It will always remain characteristic and remarkable that, to our knowledge, there had been no astronomers of 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 must reside inside 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 has mentioned 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 16 years, I concerned myself with the measurement of *analogical* elements of the orbit of this hidden [*latirenden*] 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 these investigations as *wool-gatherings* [musings], and called my calculations *chimerical*; jokingly I compared it with the pains of the alchemists who search for gold. During LALANDE'S visit to Gotha, I again had the pleasure of seeing my highly valued friend BODE, and the three of us came to speak on this subject. The venerable elder of astronomers [LaLande] had no strong thoughts on this planet, and had written not one syllable on it in the three editions of his *Astronomy*. So, 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 he wrote about in the *Berlin Astronomical Yearbook*, 1780, p. 167, and of which he 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* [*Schwermereyen*] is far afield, which is expressly why he explained his investigations, rather than forcing it upon anyone as true [*jemanden fr 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, that an over active imagination should not be trusted too much. Poets can probably be allowed their play, but one must criticize [verargen] a known kind of natural scientist who intends to capture Nature from upon the black ice of mysticism, displace a generally understandable language with an incomprehensible *mumbo-jumbo*, and wants to explain *obscurum per obscurius* [darkness with darkness]. After all, these men, who, enemies of their own opinions, point towards the idea-poor and unfruitful mathematics, would be well to take the above quoted LAPLACE to heart. Yet, they then rank this great man also under the *unpoetic, unaesthetic, and unphilosophical* heads, upon which they look down with sympathy.³

³Which concept of the higher analysis would these men like to have? They relegate it [analysis] to a *calculation*, and believe, perhaps, e.g., that LAPLACE had reckoned the true *cause* of secular equations according to a Rule of Three, without spirit, and quite *mechanistically*. *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* utopian system no longer can

KEPLER, who often amused himself with similar astronomical wool-gathering, 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 between the six planetary orbits known at that time. And, truly, the intervals according to new observations agree very well with this law. But alas! (remarked Prof. WURM) *Euclid and Nature leaves Uranus with no regular solid*, and, in addition, I submit that also no more remain for Hera. *The early name for the asteroid Ceres*. - translator With that, KEPLER'S *ingenious Ideal* becomes, all at once, totally nullified.

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

It is probably most natural to suppose, as Prof. BODE had also done in his *Commentary on Astronomy*, that this planet is smaller than Mars, and, from its already considerable distance beyond [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 twinkle between colored shades of red and green, as e.g. Mars does, and also the double star γ in Andromeda, whose light decreases and increases, and even completely 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, which is why it is so much bigger than it should be according to the laws of probability. As it were, it thus represented the place of two planets. KANT ascribed the smallness of Mars and its lack of satellites to the same cause. Only, this hypothesis is not really required to explain the hitherto persisting invisibility of this planet. It is known much more naturally, and more fairly through natural law. How long did *Uranus* remain hidden to our eyes? and yet, it not only resides in the heavens, but, as we now know, it was seen and measured by French, German, and English astronomers, even 20, 30, and 90 years before HERSCHEL'S discovery of the same. How could Prof. WÜNSCH, therefore, in the second edition of his *Cosmological Conversations of 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 diligence?* When this planet [Hera] has been finally discovered, or really already

nor could be changed. They think, *one calculates where there is nothing to calculate.*

⁴Georg Christoph Lichtenberg (1742 - 1799) was professor of physics at Göttingen University from 1769 until his death. He was one of Karl Gauss's 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.

has been discovered, only then will it surely become very understandable, why this planet, appearing telescopically as a star, could keep itself hidden for so long under the countless multitude of these stars. Prof. *Wünsch* thinks that, since one can see the satellites of Saturn and Uranus, which, however, shine with only a pale reflection, through the best telescopes, so this hidden planet had probably also been observable. But Prof. *Wünsch* did not consider, that it is another task completely, to seek out an extremely small, moveable point of light, itself distinguished through nothing, changing its place *somewhere* in immeasurable space, or to spy up a satellite, not always in close proximity to 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 subject 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, 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 draw this hidden planet [into view], I limited myself only to the stars of the Zodiac, and produced my zodiacal star catalogue in right ascension, assuming that that it were likely to be only on this path, according to plan.

[to be continued...]