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## Mercury's Rotation Report

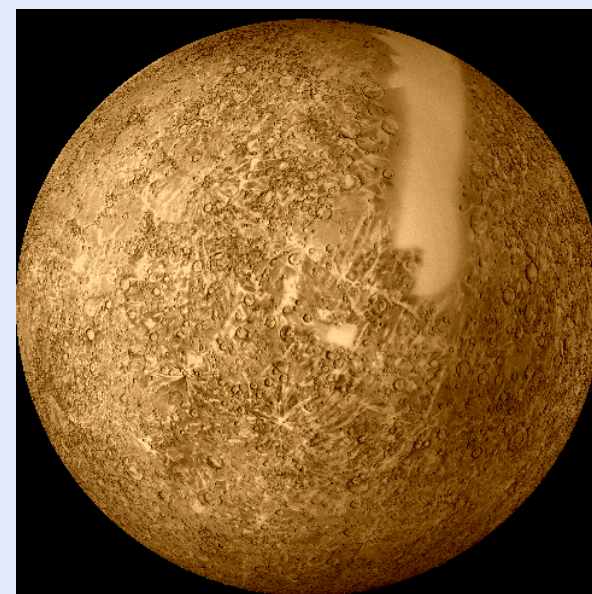
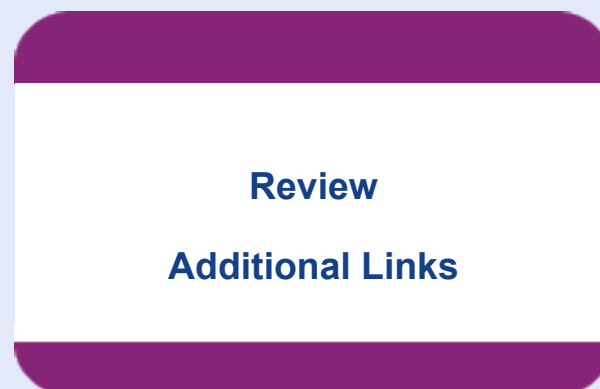
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Prepared by Halbert Katzen, J.D. with special thanks to  
Chris Halvorson, Ph.D.  
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### Mercury's Rotation Summary

*The Urantia Book* states that tidal friction causes the axial rotation of heavenly bodies to slow to a stop (relative to the body around which they revolve) and cites Mercury and the moon as examples. It has long been well established that the rotation of the moon has stopped, and it was also believed at the time of publication (1955) that Mercury's rotation had ceased. Though the widely held belief at the time of *The Urantia Book's* publication was that Mercury had stopped rotating, when *The Urantia Book* addressed the subject of tidal friction slowing orbiting bodies to a stop, it did not state that Mercury had stopped and only portrayed the moon as a body that had stopped rotating due to tidal friction. In 1965 we learned that Mercury does have a slow rotation. *The Urantia Book* avoided the trap of agreeing with science that was wrong, but widely accepted, at the time of its publication.



### Mercury's Rotation Review

This report is unlike most of the other reports on UBtheNEWS. Most reports are about how advances in science are corroborating historic and scientific information that was not supported in 1955 when *The Urantia Book* was published. This is an instance of how *The Urantia Book* avoided the pitfall of agreeing with science that was inaccurate at the time of publication. This is the very lowest level of corroboration and might simply have been ignored altogether, if it were not for the misunderstandings about this issue both within and outside of the community of Urantia Book readers.

The misunderstandings relate to the use of terminology and the grammatical construction of the sentence relevant to this topic. Misunderstandings about these issues have caused Urantia Book readers and non Urantia Book readers alike to conclude that this is an instance of inaccuracy in *The Urantia Book*. This history of misunderstanding makes the topic an important one to be covered by UBtheNEWS, even though the credibility that the topic provides *The Urantia Book* is considerably less than the reports about conflicts that have turned in corroborations. In this case, there never was a real conflict between *The Urantia Book* and the science of 1955, except in the minds of those who misread and/or misinterpreted what it says.

Because of the historical controversy related to this subject, this report will first address the issues

of terminology and interpretation before getting into the substance of the topic. To provide some context, here are the two relevant sentences from *The Urantia Book*:

The planets nearest the sun were the first to have their revolutions slowed down by tidal friction. Such gravitational influences also contribute to the stabilization of planetary orbits while acting as a brake on the rate of planetary-axial revolution, causing a planet to revolve ever slower until axial revolution ceases, leaving one hemisphere of the planet always turned toward the sun or larger body, as is illustrated by the planet Mercury and by the moon, which always turns the same face toward Urantia [Earth].<sup>1</sup>

The question regarding terminology has to do with defining what it means for “axial revolution/(rotation)” to cease.<sup>2</sup> For a reputable and sophisticated definition of this question we turn to the Nikola Tesla. From a 1919 *New York Tribune* article we have the following commentary on the subject:

I intended to be explicit on this point, as may be judged from the following quotation: “The unfailing test of the spinning of a mass is, however, the existence of energy of motion. The moon is not possessed of such vis viva.”<sup>3</sup> By this I meant that “axial rotation” is not simply “rotation upon an axis” as nonchalantly defined in dictionaries, but is circular motion in the true physical sense - that is, one in which half the product of the mass with the square of velocity is a definite and positive quantity.

. . . If, in conformity with mathematical principles, we imagine the entire mass concentrated at a distance from the centre equal to two-fifths of the radius, then the calculated rotational velocity is 3.04 feet per second, at which the globe would contain 11,474,000,000,000,000 short foot tons of energy, sufficient to run 1,000,000,000 horsepower for a period of 1,323 years. Now, I say that there is not enough energy in the moon to run a delicate watch.

...

Mr. Manierre is mistaken in his surmise as to what would happen if the earth were suddenly eliminated. Let us suppose that this would occur at the instant when the moon is in opposition. Then it would continue on its elliptical path around the sun, presenting to it steadily the face which was always exposed to the earth. If, on the other hand, the latter would disappear at the moment of conjunction, the moon would gradually swing around through 180 degrees and, after a number of oscillations, revolve again with the same face to the sun. In either case there would be no periodic changes, but eternal day and night, respectively, on the sides turned toward and away from the luminary.<sup>4</sup>

Clearly, Tesla had a critical attitude toward the analytic abilities of those who reject his definition, disparaging such positions to the status of what is “nonchalantly defined in dictionaries.” The point here, however, is not that *The Urantia Book* and Tesla are “right” about how the term is defined and that all other definitions are “wrong.” Quite to the contrary, as the critiques levied against *The Urantia Book* indicate that the conflicting definitions are still with us almost one hundred years after Tesla wrote on this subject. To attempt an authoritative definition of the term would be overreaching and counterproductive. When discerning the meaning of writing, readers have a proactive obligation, if they are going to have intellectual integrity, to give latitude to authors regarding the definition of terminology. Anyone who opens a dictionary readily finds that multiple definitions are a fundamental aspect of language. And, as in the instant case, occasionally these multiple definitions may even be at odds with each other.

The definition used by *The Urantia Book* is altogether reasonable and withstands the critiques launched against it, asserting that it has “erroneously” defined the term. Creating controversy over the definition of terms merely avoids giving serious consideration to the substantive concepts being expressed. Those wanting to deal with substantive issues, rather than setting up “straw-man” arguments, have an obligation to make a best effort at discerning the intended, substantive meaning of an assertion, no matter how the author chooses to define terms. What is meant by *The Urantia Book* when it states “axial revolution ceases” is not only abundantly clear from the context in which the phrase occurs, but also stands in good stead with the definition used by the well-renowned Nikola Tesla. Thus it is shown that the critiques that have been launched against *The Urantia Book* for the way it uses terminology not only reflect an interest in avoiding the substantive

issues, but also show themselves to be poorly researched and less sophisticated regarding the use of language with respect to this subject matter.

With regard to the issue of interpreting the sentence in *The Urantia Book* about Mercury's rotation (or lack thereof), some people have suggested *The Urantia Book* says that Mercury's axial revolution has come to a stop and that, therefore, *The Urantia Book* is incorrect. This opinion comes from extracting the following phrases from the sentence in which they occur: "leaving one hemisphere of the planet always turned toward the sun or larger body, as is illustrated by the planet Mercury."

This is a flawed analysis of the phrases because they are being analyzed without respect to the preceding phrases and the previous sentence. The relationship of the phrases in question to the rest of the sentence and the previous sentence is necessary for a proper understanding of the intended meaning.

The previous sentence states: "The planets nearest the sun were the first to have their revolutions slowed down by tidal friction." Here it is important to note that the larger context is specifically about our solar system and the lead-in sentence of the paragraph, quoted above, relates to planets in our solar system being slowed by tidal friction. It does not say that any of the planets have stopped due to this effect. The slowing is the issue being noted and there is no mention here or anywhere else of any planet having already stopped its rotation (or revolution). Though this first sentence would not be inconsistent with a planet having stopped, it certainly does not imply or suggest such a thing either.

Next, and more importantly, we must appreciate the phrases within the context of the sentence in which they occur.

The phrases in question are qualifying and clarifying phrases, additions to the main point of the sentence. To understand the last part of the sentence one must start with the first part of the sentence: "Such gravitational influences also contribute to the stabilization of planetary orbits while acting as a brake on the rate of planetary-axial revolution, . . ." This first part of the sentence is itself a complete thought/sentence. A period could have been put at the end of this first part of the sentence and it would have been grammatically correct. Not only would it have been grammatically correct, but additionally and more to the point, it would have been instructive all by itself because it brings together two distinct issues. The one issue being the stabilization of orbits and the other being the braking effect on axial revolution. As well, this first part of the sentence refers to the "brake on the rate" and says nothing about this braking effect having caused a planet to fully stop its rotation. By starting with a complete thought, grammatical conventions require us to interpret what comes afterwards (and is separated by commas) in terms of how it fundamentally relates to this initial concept/complete thought.

The first qualification/clarification, separated by commas, that comes after the complete thought is: "causing a planet to revolve ever slower until axial revolution ceases, . . ." The clarification is that the process mentioned above, as regards the braking/slowing of the planets (clearly, this is not addressing the orbital stability issue), is that *eventually* there is finality to the process, the planet stops. This does not state *or imply* that any particular planet has reached the point of having stopped because everything that comes before this comma-separated phrase is in general terms. Therefore, this phrase should not be construed to mean that stoppage has actually occurred, only that the process of tidal friction will eventually lead to this result.

The next comma-separated phrase — "leaving one hemisphere of the planet always turned toward the sun or larger body" — clarifies and expands the previous phrase. This phrase refers to the process of tidal friction working on an orbit body's rotation until the body stops, the completion of the tidal friction effect. There is still no statement or implication to the effect that any planet has experienced the completion of the tidal friction effect. What this phrase does by way of clarification of the previous phrase is to state specifically what is meant by stopped (i.e. one hemisphere always turned toward the sun, the Tesla definition) and then it adds an additional clarification that this process not only relates to planets but also to other orbiting bodies. This is what the "or larger body" contributes to the clarification of the main point regarding the effects of tidal friction on planets; it expands the tidal friction effect to other orbiting spheres.

Then comes the next comma separated clarification — "as is illustrated by the planet Mercury and by the moon" — which enhances the meaning of the previous phrase. To understand what "illustrated" refers to, one must look at the subject matter being addressed in what comes before

(not after) this phrase. The subject matter is, of course, the braking effect caused by tidal friction and the phrase gives an example of another “larger body” around which there is a smaller orbiting body.

The last clarifying phrase naturally relates to the phrase that precedes it and distinguishes the moon from Mercury. It could have just as easily said something like, “both of which now turn the same hemisphere toward the body around which they orbit.” But it does not do this. Instead, it distinguishes these two bodies from each other by only addressing the status of the moon. By distinguishing the two spheres from each other, it leaves Mercury standing alone as an example of the main subject of the sentence, i.e. that tidal friction slows planets down, *eventually* to a stop, and first affects the planets closest to the sun.

Thus it can be seen upon close and grammatical analysis of the sentence that it does not make any comment about whether Mercury has stopped rotating. Wisely, *The Urantia Book* avoids this subject altogether.

Having addressed the issues related to the definition of terminology and interpretation of the sentence, we can now turn our attention to the history of our (mis)understanding about Mercury’s rotation and how this relates to the statements made in *The Urantia Book* on this subject.

Wikipedia.com provides the following commentary:

“For many years it was thought that Mercury was synchronously tidally locked with the Sun, rotating once for each orbit and keeping the same face directed towards the Sun at all times, in the same way that the same side of the Moon always faces the Earth. [Note that the definition used by Wikipedia is the one “nonchalantly defined in dictionaries.”] However, radar observations in 1965 proved that the planet has a 3:2 spin-orbit resonance, rotating three times for every two revolutions around the Sun; the eccentricity of Mercury's orbit makes this resonance stable — at perihelion, when the solar tide is strongest, the Sun is nearly still in Mercury's sky. The original reason astronomers thought it was synchronously locked was because whenever Mercury was best placed for observation, it was always at the same point in its 3:2 resonance, hence showing the same face.”<sup>5</sup>

This discovery was made ten years after publication of *The Urantia Book*.

Notwithstanding that *The Urantia Book* avoided the pitfall of agreeing with science that was wrong at the time of its publication, there is an actual disagreement (in contrast with the misperceived ones already addressed) between *The Urantia Book* and contemporary science. While *The Urantia Book* says that tidal friction causes “a planet to revolve ever slower until axial revolution ceases,” contemporary science generally supports the notion that Mercury has a stable 3:2 spin-orbit resonance.

Whether further research will harmonize with *The Urantia Book*’s assertion that tidal friction will cause the planet to cease rotating is still an open question. And whether such harmony will occur any time soon is doubtful because current observations suggest that its 3:2 spin-orbit resonance is stable. Nonetheless, additional observations may yet reveal that Mercury’s axial rotation has a measure of instability that will eventually knock it out of what currently appears to astronomers as a stable 3:2 spin-orbit resonance.

Mercury is known for having an “eccentric” orbit. Wikipedia.com states, “The orbit of Mercury is the most eccentric of the major planets, with the planet's distance from the Sun ranging from 46,000,000 to 70,000,000 kilometers.” This eccentricity creates variations in the speed of its orbit. Tidal friction, which is an ongoing process, may yet cause a shift in both the orbit and axial rotation of Mercury.

Some research has gone in the direction of calculating such a probability/possibility that Mercury could have developed a 1:1 spin-orbit resonance, or to it put another way, no axial revolution with respect to the sun. From l’Observatoire de Paris’ analysis in a report titled *The explanation of Mercury's capture into the 3:2 spin-orbit resonance as a result of its chaotic orbital dynamics*, we have the following:

“With their extended numerical simulations, the researchers found that the capture into the 3:2 resonance is in fact the most probable outcome of the planet, with 55.4 % chances to occur. The remaining possibilities being a capture into the 1/1 resonance

(2.2%) as for the Earth-Moon system, capture into the 2/1 resonance (3.6%), or no capture (38.8%). Temporary capture into higher order resonances (5/2 or 3/1 for example) are possible, but none of them survived over the full integration, as they become destabilized when the eccentricity of Mercury decreases to low values.”<sup>6</sup>

This leaves the question a bit open by indicating that other possibilities existed. However, the vast majority of research on the subject does not address other possibilities the way they are talked about in the above article and there seems to be a fairly uniform acceptance of the notion that the rotation is stable for the foreseeable future. Even this article suggests that the other possibilities were with respect to things that could have happened during Mercury’s initial stages of development not future developments.

Still, even though opinions among astronomers on this subject today are about as stable as Mercury’s current 3:2 resonance seems to be, this continues to be an ongoing area of investigation. Satellite probes and earth-based observations continue to provide new data that may yet reveal a degree of instability. Just as astronomers were surprised in the 1960’s with the discovery that Mercury is not in a 1:1 resonance with the sun, technological advances may again provide a more accurate picture allowing us to forecast a future 1:1 resonance. In any case, *The Urantia Book* was not erroneous in stating that Mercury has ceased rotating because it simply does not make this claim. Quite to the contrary, it did a good job of avoiding erroneous science at the time of publication.

#### **Footnotes:**

<sup>1</sup> [UB 57:6.2](#) This mode of citation to the Urantia Book provides the chapter (referred to as "Papers" in *The Urantia Book*), then the section, followed by the paragraph number. “Urantia” is a coined word with the etymological meaning “(y)our place in heaven.”

<sup>2</sup> Physics conventions regarding the use of the terms “rotation” and “revolution” have gravitated toward using the word “rotate” to reference what a sphere may do with respect to its own axis, while “revolution” is used to reference what such a body may do by way of orbiting around another body. Using the terms synonymously, *The Urantia Book* clearly does not follow this convention. This makes no difference to the issues at hand and has never been a point of contention no matter what position people have had on this topic.

<sup>3</sup> Definition of Vis viva: [L.] (Mech.), living force; the force of a body moving against resistance, or doing work, in distinction from vis mortua, or dead force; the kinetic energy of a moving body; the capacity of a moving body to do work by reason of its being in motion. [1913 Webster]

<sup>4</sup> <http://www.rastko.rs/projekti/tesla/delo/10847> New York Tribune — Feb. 23, 1919; Tesla Answers Mr. Manierre and Further Explains the Axial Rotation of the Moon. OCR by: Varsányi Péter (Pepe) [www.tesla.hu](http://www.tesla.hu). Verzió: 1.00 (2003-11-08)

<sup>5</sup> [http://en.wikipedia.org/wiki/Planet\\_Mercury](http://en.wikipedia.org/wiki/Planet_Mercury)

<sup>6</sup> <http://www.obspm.fr/actual/nouvelle/jul04/merc.en.shtml>, second to last paragraph.

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### **Mercury’s Rotation Additional Links**

[UB 57:6.2](#)

1976 article on this subject by Charles (Chick) Montgomery:

[http://www.ubhistory.org/Documents/PA19761201\\_Agondonter\\_04.pdf](http://www.ubhistory.org/Documents/PA19761201_Agondonter_04.pdf)

[http://en.wikipedia.org/wiki/Planet\\_Mercury](http://en.wikipedia.org/wiki/Planet_Mercury)

<http://www.obspm.fr/actual/nouvelle/jul04/merc.en.shtml>

<http://cseligman.com/text/planets/mercuryrot.htm>

<http://cseligman.com/text/planets/DayOnMercury.swf>

<http://edition.cnn.com/2007/TECH/space/01/22/moon.destiny/index.html>  
Earth's moon destined to disintegrate

