LESAGEAN GRAVITY ATTENUATION AND LUNAR ECLIPSES

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During a lunar eclipse the earth blocks (or shadows) the light of the sun upon the moon; however, it is held that the earth does not, likewise, shadow or attenuate the sun's gravity upon the moon. I am of the opinion that it does and that observation of the moon's motion, especially the direction of the line of nodes, bears this out. Specifically, I have examined the long-neglected works of Newcomb, De Sitter, and Bottlinger published in the years 1909 to 1914.[1, 2, 3, 4, 5]

These references attempt to account for all the gravitational influences on the moon's motion in accordance with non-attenuated "action-at-a-distance" gravity and then to analyze the remaining residual effects. Newcomb[1] and De Sitter[2, 3] found unexplained effects but chose to ascribe them to unexplained gravitational effects. They chose not to accept the possibility of LeSagean gravity (i.e. gravitational attenuation or shadowing). Bottlinger,[4, 5] on the other hand, computed the effect of short intermittent reductions of gravity during lunar eclipses from the years 1830 to 1910. These reductions lasted for a few minutes and occurred about every year. Since the sun and moon are nearly lined up with the earth's center, these reductions produce an outward radial lunar perturbation.

I supply a very brief analysis, though crude, indicating the nature of Bottlinger's thorough examination. In the figure below, the moon's orbit is projected onto the celestial sphere centered at the earth's center, P_o. This orbit is indicated by arc NQM where N is the moon's ascending node and Q is the moon's current position. Point A is the lunar perigee (closest point to the earth). Arc XNY indicates the projection of the earth's equator onto the celestial sphere. We are concerned with

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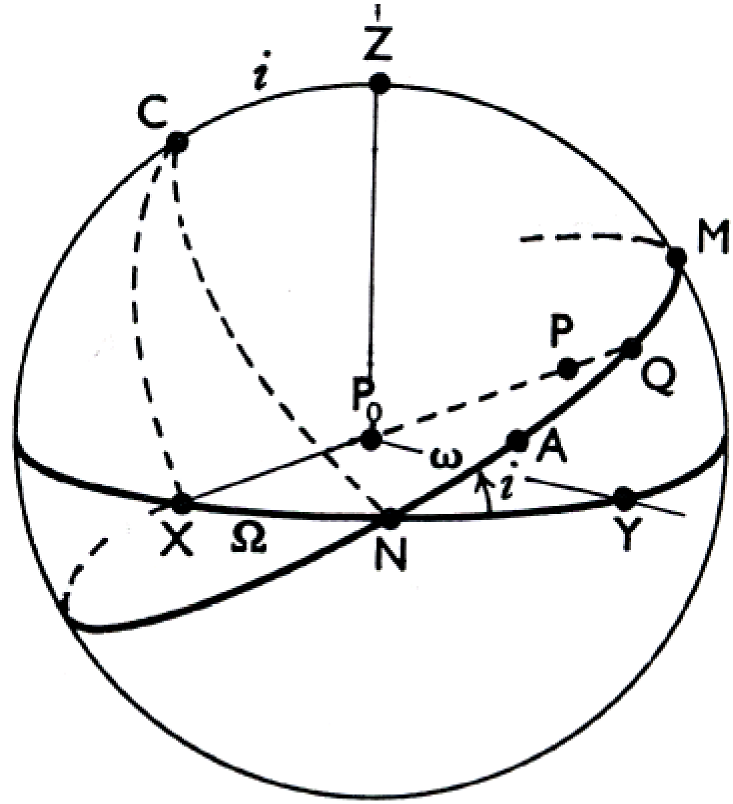
[1] Newcomb, Simon, 1909. "Fluctuations in the Moon's Mean Motion," *Monthly Notices of the Royal Astronomical Society*, **69**, part 1, pp. 164-169.
[2] De Sitter, W., 1913. "The Secular Variations of the Elements of the Four Inner Planets," *Observatory*, **36**:296-303.
[3] De Sitter, W. 1913. "On the Absorption of Gravitation and the Moon's Longitude," *Proc. of the Koningklijke Ned. Akad. Wet. Scr.*, **15**:808-839.
[4] Bottlinger, Curt, 1912. "Die Erklärung der empirischen Glieder der Mondbewegung durch die Annahme einer Extinktion der Gravitation im Erdinnern," appeared in the *Astronomische Nachrichten*, **191**, No. 4568, Cols. 147-150. An English translation of this paper appears in this issue of the *Biblical Astronomer* on page 5.
[5] Bottlinger, Curt, 1914. "Zur Frage der Absorption der Gravitation," *Sitzungsberichte–Bayerische Akademie der Wissenschaften Math.–Naturwissenschaft. Klasse*, pp. 223-229. The title translates to "On questions about the absorption of gravity."

$\omega' = \Omega + \omega$, where Ω is the angle from the fixed reference direction P_oX to node N measured along the equator and ω is measured in the moon's orbital plane from ascending node N to perigee position.



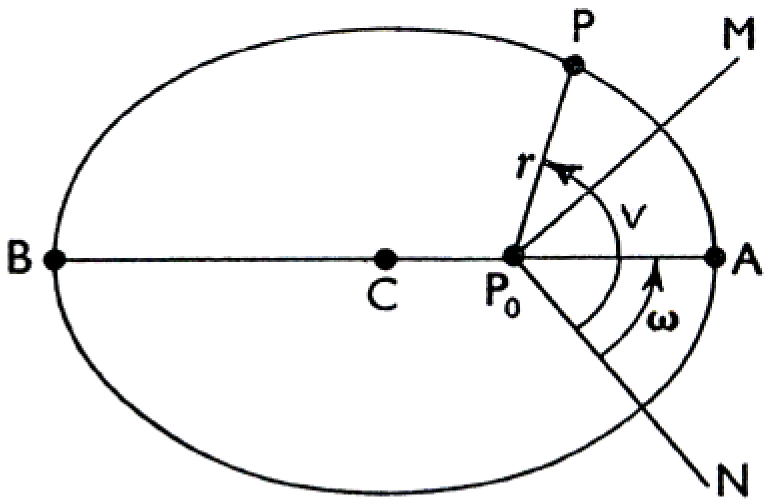
Let *R* be the radial perturbation due to the earth's attenuation of the sun's gravity. Then we write:[6]

$$d\omega'/dt = -\sqrt{(1-e^2)}\ (nae)^{-1}\ R \cos v$$

where *e* is the lunar eccentricity, *a* the semi-major axis, *n* the mean angular motion, and *v* is the moon's angular position (true anomaly).

Assume one eclipse (usually partial) per year for *j* years. If M_s and M_l are the sun's and moon's mass, *D* the earth-moon distance, and *h* the earth's gravitational attenuation, then:

[6] Moulton, F. R., 1914. *An Introduction to Celestial Mechanics*, 2nd edition, MacMillan Co., p. 406.



$$R = - M_s\, M_l\, D^{-2}\, e^{-h}.$$

Let Δt be the eclipse duration and note that the average value of cos *v* is

$$\text{avg}(\cos v) = (1/\pi) \int_0^{\pi} \cos v \, dv = 2/\pi$$

Then we may compute Δω' from

$$\Delta\omega' = -(2/\pi)\,(nae)^{-1}\, R\, j\, \Delta t.$$

We have that $M_s = 2.0 \times 10^{33}$ gm, $M_l = 7.4 \times 10^{25}$ gm, $D = 1.5 \times 10^{13}$ cm, $a = 3.84 \times 10^{10}$ cm, $e = 0.055$, $n = 82$ rad/yr, and from the data of references 1-5, $\Delta\omega'/j = 6.3 \times 10^{-5}$ rad/yr. Hence we may solve hor *h* thus giving $e^{-h} = 4.2 \times 10^{-21}$. Δω' was obtained from De Sitter's cycle of 20" with a period of 150 days.

Relating the earth's attenuation to the general attenuation of matter, *K*,

$$h = K\, d_e\, (2R_e)$$

where d_e is the earth's density of 5.5 gm/cm^3 and $R_e = 6.38 \times 10^8$ cm is the earth's radius. This gives $K = 6 \times 10^{-9}$ cgs.

Over the last 25 years or so I have examined much experimental data concerning planetary motion, pendulums, falling object experiments, gyros, etc., and have always found evidence of gravitational attenuation and shadowing and that gravity acts instantaneously. Therefore, I was pleased to find current renewed interest in LeSage's concepts.[7]

[7] Edwards, Matthew, 2002. *Pushing Gravity, New Perspectives on LeSage's Theory of Gravitation*, C Roy Keys Inc., Montreal Canada.