ALI F. ABUTAHA

March 9, 1994

Dear Victor:

I like to answer some points raised in your letter, of February 2, 1994, and in our subsequent discussion. Many years ago, I examined Kepler's assertions about a double acceleration in each orbit of the planets and the Moon. Kepler called it "*the colure* (lure or attraction) *of the solstices.*" The double acceleration was evident (also to Tycho Brahe) after the effects of obliquity, eccentricity, etc. were eliminated. To account for the irregularity, Kepler reported that it required two eccentricities for each orbit to explain the observed irregularity. Alternatively, two accelerations in each orbit explained the observation.

I have taken the time to re-do my old analysis to show the double acceleration in each orbit, using the analemma

ANALEMMA:

1- The obliquity effect (by your equation, Almagest's Book Three, etc.) on the Equation of Time gives the 8-shaped curve, as you said, and as shown in Fig. 1. The ellipticity effect is also shown in Fig. 1, for the Earth's eccentricity of about 0.0167.

However, the combined obliquity and ellipticity effects do not agree with the "observed" analemma; as I show next.

2- The initial problem confronted by Kepler is shown in Fig. 2. The analemma measured, say by a sundial, is distinctly different from the obliquity (alone) curve.

3- By including the ellipticity effect, for the Earth, only a part of the analemma fit the calculations; as you can see in Fig. 3. The distinct difference can be explained by (a) an acceleration component in the summer solstice region, (b) excess drift in the autumnal equinox (reminiscent of Copernicus' fat equinoxes which was dismissed by Kepler), and (c) an acceleration component in the winter solstice region.

4- Fig. 4 shows what happens when we change the eccentricity (e of 0.050 instead of 0.0167). Here, the autumnal part of the measured analemma and the calculated analemma is in agreement, but the discrepancy is evident in the other part.

(Using his database) Kepler reported how changing the eccentricity would explain the "irregularity," but that that would double the "irregularity" on the other side. My Figures 3 and 4 show exactly what was meant by the need for two eccentricities, or two accelerations.

I have selected two more curves to show the discrepancy between theory and observations; Figs. 5 and 6. These compare the calculated analemma with one I derived from the 1994 Ephemeris.

Using my Figures 1 through 8, astrodynamicists will see the double acceleration in each orbit; particularly, the acceleration component in the summer solstice. Sir Isaac Newton considered the effect to be insignificant or too small, and he left it to others after him to solve. I recently discussed the above and related issues in the graduate seminar of the Department of Mechanical Engineering at Howard University, see enclosed announcement, and the presentation was rather well received by the faculty and graduate candidates. I will be glad to discuss the subject further with you, Intelsat, the American Astronomical Society or others you know.

Conclusion: The Analemma analysis demonstrates that there is an acceleration component that occurs around the summer solstice (or in the apogee region) that is not accounted for by Keplerian, Newtonian, or other methods. My temperature-gravitation concept and formulations give qualitative and quantitative answers.

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date

My old analysis of the Moon's orbit was rather more extensive than that of the analemma or the Earth's orbit. Many Arab astronomers had tried to predict the Moon's motion, if only because the Islamic annual events are based on lunar calendar. Long before I attended the George Washington University or worked at Comsat, I also made similar attempts. I thought that with Ptolemy's *Almagest* (in Arabic), and the works of Copernicus, Kepler, Newton and others, that I would succeed where others failed. I also failed. The Moon's motion is simply incomprehensible; and it remains so to this date.

My work in the space segment and then the earth segment provided clues that supported my temperature-gravitation concept. Here, I refer to orbital perturbations of satellites as we have encountered them in the last three decades, and you are familiar with the evolution of this chapter.

I mention the above background to show why I said that it is simplistic to show that "lunar apogee can occur anywhere between new and full moon," (Your letter, page 2) or that perigee does occur at full moon. With the above background, I have reconstructed my earlier analysis. I hope to win your support in the case of the Moon, and to this end, I will share with you some of my specific results.

1- Indeed, the two pages that you sent from the Ephemeris show coincidence of full moon and perigee on the three occasions that you marked. I marked these in Fig. 9. The same Figure shows no correlation between the phases, on the one hand, and apogee or perigee, on the other hand.

2- Fig. 10 shows how the reversal of the Moon's phases during one year (1994 Ephemeris).

3- Curves of the true distance to the moon vs. the day of the month for all months are shown in Figs. 11-a and b.

4- The perigees and apogees for the year are shown in Fig. 12. The learned eye can see that the orbit of the Moon is not a mere ellipse, but an infinite number of ellipses! The infinite ellipses are contained within the high and low passes of apogee and perigee, shown in Fig. 13.

5- Then, there is the relative motion of the Moon in different months, which mark specific temperature distribution over the globe. Fig. 14-a compares the motion of the moon after the summer solstices of the Southern and Northern Hemispheres (January and August). Similar comparisons are also given in the same Figure.

   I can very easily explain the behavior in Figures 14, qualitatively and quantitatively, with my temperature-gravitation effect; and I doubt that the complex and varying behavior can be explained with some mysterious and invisible Mascons (mass concentrations). But to arrive at the correlation that can convince the astrodynamicists required further analysis.

6- Figures 15 show the maximum and minimum inclinations of the Moon for this year.

   I will not bore you with more figures of the Moon's libration in longitude and latitude, eclipses, fraction of illumination, etc., etc.

There are hidden correlations that have not been identified before (at least, I do not know of anyone else who identified them in modern and ancient times). From many tables, figures, and computations; I can say the following:

1- There is a correlation between perigee and minimum inclination of the Moon's orbit and between apogee and maximum inclination, as I show in Figs. 16. From other tabulations (such as portrayed in Fig. 17), I can also say that *perigee occurs after minimum inclination and apogee occurs after maximum inclination.*

Why does the Moon hasten to one perigee, or slows down towards an apogee is a function of the terrestrial seasons (marked by specific temperature distributions) and the time of viewing of the North or South poles of the Earth. The Arctic and Antarctic icecaps are shown in Fig. 18; where you can see that the south cap sits squarely on the south pole while the north cap is centered around 75°. The effect of the location of the icecaps can also be seen in the case of the analemma; (see previous Section), where the acceleration in the summer solstice begins soon after April (early viewing of the North icecap) while the winter solstice acceleration is delayed until after October, due to the late viewing of that cap.

Without going into more figures and calculations, let me give you some other relevant conclusions drawn from the above analysis that can be quickly verified, particularly, by the AAS members.

1- In addition to the long-known few moons of the Earth, Jupiter, and Saturn, many satellites and rings have been discovered in the last three decades; and the basic characteristics of these satellites are already included in modern textbooks.

The eccentricity of the orbit of a satellite is determined by how close it is drawn to the parent planet, and I say that that is determined by how the surface temperature (primarily of the parent planet) modulates the primary gravitation (which I say is produced by the screened temperatures in the planet and satellite). Generally, the polar regions on the planets (excluding Uranus) are colder than the equatorial regions. On the basis of my theory, those satellites which are near the parent planet and which do not come into view of the polar regions will have small, or no, eccentricities; whereas those satellites which are far enough so as to view the poles will have measurable eccentricities. This statement is true of just about all the moons we know today!

2- Another example is that of the orbit of Mars. The time of apogee and perigee for Earth and Mars are shown in Fig. 19. Why does perihelion for the Earth occur after winter solstice while perihelion of Mars occurs long before the winter solstice? It took a long time to reason my way through this one, but the answer was simple.

After the Autumn Equinox, the south icecap on Mars begins to (literally) evaporate, and before the winter solstice, the icecap disappears altogether! The disappearance of the icecap exposes the underlying lands to the sun rays, and as the south regions (including the icecap area) heats up, the gravitational attraction lessens and Mars begins to drift farther from the sun sooner than the winter solstice.

In the case of the Earth, both icecaps remain intact. Also, while the permafrost in the north can melt by as much as fourteen feet during the summer, the depth of the permafrost is 1,000–1,500 feet; and the underlying temperature (and hence, the gravitational pull) is hardly affected.

3- And so can the small eccentricity of Venus be explained by noting the heavy cloud cover which does not allow extremities of surface temperature, as in the case of Earth and Mars.

In summary, Kepler was right, the primary effect is terrestrial (or planetary), the effect lies in the poles, and more importantly, the effect is governed by the "*posture*" or attitude of the poles.

DEPARTMENT OF MECHANICAL ENGINEERING

HOWARD UNIVERSTIY

GRADUATE SEMINAR

SPEAKER: Ali F. AbuTaha is a mechanical engineer, and he began his aerospace career in 1969. His research of today's subject began in the 1950's. Mr. AbuTaha is a Distinguished Life Member of the Armed Forces Communications and Electronics Association and a member of other technical and scientific groups.

TOPIC: TEMPERATURE-GRAVITATION AND ORBIT PERTURBATIONS

ABSTRACT: "No part of celestial physics was more difficult to explain than [the DOUBLE acceleration of the Moon in each orbit]," wrote Kepler 400 years ago. Planets and satellites exhibit the same behavior, which perturbs elliptical and synchronous orbits. The speaker will present old and modern data that confirm the odd behavior, discuss Kepler's solution(s), and describe why those solutions were abandoned by the 17th century predominant Mechanical Philosophy. The speaker will show how Temperature-Induced-Gravitation can explain the above, and other, gravity puzzling phenomena. The governing formulas, numerical examples, and crucial tests will be presented.

TIME: 1:10 pm - 2:00 pm

DATE: February 18, 1994