

COMMENTS ON THE LYM ANIMATIONS OF KEPLER'S NEW ASTRONOMY

Class with Bogotá LYM

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INTRODUCTION: ON THE SURPRISE OF CURRENT HISTORY

I wish to start today with a comment on Lyn's Berlin webcast of October 31st and address one aspect of the element of surprise that struck me in his opening statement. Lyn started by saying:

"{ You know the worst and the best moments in history come to most people, of the time, as a surprise. And that is going to be the case with what is happening in the world now. We are now at the end of an entire period of history. }" {Morning Briefing, Wednesday, November 1, 2006.

What Lyn is saying is that we have come to the end of the imperial period of history, which had started essentially at the Treaty of Paris of 1763 with the creation of the British-Dutch East India Company. This is the end of the Age of Empire, and what we are living through is the breakdown of the system of Empire. Lyn warned that this breakdown would not come as you think it will, and that people are not prepared for the shock. Our job is to wake them up to the reality of that coming shock. The truth about it is that we are the only ones who can win this fight. Our enemy cannot win, because if they win we all loose, including them.

Now, hear me carefully: one aspect of the surprise is that this historical event will take the form of an inversion, which will be very similar to what Kepler had to deal with in his {*New Astronomy*}. That is, the implementation of the {*Principle of the Advantage of the Other*} of the Peace of Westphalia, which is essentially characterized by {*gratuitous actions*} (desintersado?) of human beings towards each other and which are based on {*agape*}, or justice and love of mankind. This means that we will soon be entering into a period where economic actions between human beings will no longer be competitive but will be based on giving to others without the expectation of receiving anything in return. The {*advantage of the other*} is for the other only, and not for the other first and for me after. The only advantage, or reward, I get is to {*make someone else happy*}. And, that is the role of the {*Monge Brigade*} leader.

Now, let me explain this principle a little bit more. Everything in the universe is submitted to axiomatic changes in paradoxical ways, such that the individual fritters away and dies, while the universal grows with time. For that very reason, a gift given freely to another without any expectation of something in return is a universal act of benevolence, which will always grow with time in the memory of the one it was given to. A benevolent action of {*agape*} never dies because it is an unalterable principle of the universe itself. So, don't worry if people don't understand right away what is happening to them in this historical period. They are confused and perplexed. And that is good. However, you cannot be confused because your fellow man needs help in realizing that the universe is on your side and is working from the same principle!

Mean and Apparent Oppositions

Chapter 3: First Inequality

THE LIES IN THE MATTER OF TRUTH.

When you look at the sky, how can you tell if what you see is true or false? The short answer is: when you discover what you see is not reality, but merely a shadow, as Plato showed in his {*Republic*}; that is, a projection of reality on your sensory apparatus. The longer answer is found in Kepler's {*New Astronomy*}, and it is when you develop an entire science as shadows of universal physical principles. Then, you have a better approximation of the truth.

When I was living in Canada, about thirty years ago, I discovered that the British lied all the times. Not so much the British individual, but the whole people as a species lied; because they made believe that Canada was a free and independent country. I knew that was a lie because Canada was not a republic, but a colony of the British Empire, that is, it existed for the pleasure of the Crown of England, since 1763. However, the most interesting part of it was that I discovered {*how the British lied*}, and therefore, I discovered something very important. When you discover {*how*} somebody lies, you discover a completely new domain of reality that you did not know existed before. And this made me realize that {*what I did not know*} was the greatest part of what there was to know. That was a big day for me! I began to have knowledge of my own ignorance.

Furthermore, I also discovered that if the British lied to me all the time, I could trust them, because they always lied in the same manner. Now, the same thing happens when you look at the sky. You realize that the sky lies to you all the time and that what you see, with your sense perception apparatus, is never reality but a deformed projection of the real world. You may not know what the truth is, about the starry vault of the heavens, but you can trust that it will always lie in the same way. There is a definite pattern to it. This is a most powerful advantage, because it gets you to know your own limitations, and your power to supersede these limitations. And so, the next step in this process is to ask: under what circumstance can I know the truth? And the short answer to

this is essentially: when the patterns of lies change! It is change that gives you the truth. The longer answer is Kepler's *{New Astronomy}*.

So, think about what Lyn said at the Berlin webcast of October 31st when he answered what I think was the last question. He said that the mission for the LYM was to master the physical geometry of Kepler, of Leibniz, of Gauss, and of Riemannian hypergeometry. The reason Lyn is emphasizing animations so much is that he wants people to think in terms of processes of change, as opposed to things in themselves, or things in a fixed state. Now, think that any form of fixed state is a lie. So, what we must be attentive to with Kepler is the method by which he treats his astronomical observations as changes in the position of the observers and in the position of the planets, and the changes that are going on in his own mind about those changes. There is nothing but change.

Sometimes, and this has been happening to me also, you tend to get bogged down by some particular question, like the “*{equant}*,” for example, that I asked you about a few weeks ago. Then, what happens is that you think that you cannot go any further without elucidating that question first. Well, that is wrong. The idea is to keep going and concentrate on the method rather than the particular case of a question which you can always come back to later. The most fundamental aspect is the scientific method, not the particular observation. Let me give you an example.

THE DIFFICULTY OF CHAPTER 3.

The LYM animation for chapter 3 is very incomplete and requires some more work. The animation is perfect, but it requires some explanation. In **Chapter 3**, Kepler raised the question of equivalence about similar and different points of observation with reference to what he had said in chapter 1 and 2 of his *{New Astronomy}*. This reference to chapter 1 and 2 is missing in the LYM animation, and this should be corrected, because Chapter 1 and 2 involve several important clarifications between and eccentric and an epicycle on a concentric, and their inversion with respect to the position of the observer. (Compare the illustrations from pages 119, 123, and 131.) The issue is about equivalences and differences of planetary paths with respect to fixed and moveable observers and their physical causes. If these lies are missed, you will be missing the truth the rest of the way.

Take the Kepler illustration of page 119 and compare it with **Figure 3** [The **INVISIBLE ARM** of Pythagoras applied to Jupiter] that I sent you last week. You can see the lie formed by the three-body problem in your mind's eye, that is to say, a triple motion between 1) the INVISIBLE ARM pointing at the epicycloid of Jupiter, 2) the INVISIBLE ARM pointing at the invisible Sun, and 3) the INVISIBLE ARM as the shadow of the invisible orbit of the earth around the sun. The lies of the matter come together pointing at the truth of the principle of gravitation of Kepler.

Now, take the illustration of page 123 and study it carefully with what Kepler said on page 122:

“{There, an eccentric is shown to be equivalent to an epicycle on a concentric, provided, that is, that the line of apsides in the eccentric and the line through the center of the epicycle and the planet on the concentric always remain parallel, and that the semidiameter of the epicycle in the latter is equal to the eccentricity of the former, while the semidiameters of eccentric and concentric are equal. And also provided that, in the former, the planet is moved uniformly on its eccentric, so as to traverse equal arcs in equal times.}” (p.122)

I want to emphasize that this Keplerian difference and similitude between an eccentric and an epicycle is derived from a more ancient projection relating the celestial equator and the ecliptic, which also implies that the sun travels in equal angles during equal times, but not equal arcs. This is perfectly coherent with the stereographic projection of Hipparchus for the construction of the rete of an astrolabe. The only meaningful difference between the Hipparchus construction and the Ptolemaic construction is that in the Ptolemaic model, the concentric and eccentric circles must have the same size. However, this raises the question of the **FIRST INEQUALITY** in a very nice way. This would be a perfect model if you could account for the inequality of speed all around the orbit. But that is not reality. See animation of chapter 3. From here, you can jump to page 145, in chapter 5 and understand what the central question is all about. As Kepler said:

{The question is raised whether one and the same true path of the planet in the heavens (this is presupposed) can present two sets of appearances, one to the observer at δ and another to the one at α , both proper to those places and both such as comply with and admit the Ptolemaic form of computation.

If the planet were of equal speed at all parts of its orbit, the answer, according to what was said in chapter 3, is yes. But since, in terms of real and true elapsed time, the planet is slowest at one point on the eccentric, and fastest at the opposite point, the answer must therefore be, clearly not.} (p.145)

In chapter 3, Kepler supposed that equivalence and unanimity of different observations could display the same appearance through changing the position of the planet with respect to a fixed observer. One interesting feature of this is that you can also change the respective position of the observer and the planet, and obtain the illusion effect of not knowing which one is in motion. Maybe the two of them are in motions. Note how in the two figures of page 131 the angle formed by **IAE** for the two positions of the planet is the inversion of the angle formed by **$\acute{\alpha}\delta\beta$** for the two positions of the observer. Similarly the angle for the two positions of the planet at **HDG** is the inversion of the angle for the two positions of the observer at **$\acute{\alpha}\gamma\beta$** . Thus the positions of the observer and of the planet are as mirror images of each other.

However, if the appearance is the same, it is because 1) *{the parallel distances between **BE** and **BC** are the same}* and because 2) *{the planet traverses equal arcs in*

equal times. } Again, from the very beginning of Kepler's investigation into physical causes, the question that still has to be answered is how to explain *{the different speeds at different times.}* (The same astrolabe problem that Hipparchus had to solve in order to account for longer months in winter and shorter months during summer.)

However, if you maintain a fixed path for the planet against the fixed stars, and change the position of the observer, the appearances will be different. Indeed, the first diagram shows two pathways for the same planet, one for the epicycle from **DH** and **BI** and the other from **DG** and **BE**, while the position of the observer remains unchanged at A. However, the second diagram shows that different appearances are produced when the pathway of the planet remains on the same path, but providing that the observer is moved in the different positions from α to β . Both sets of appearances will be different because of the difference in the angular position of the physical observation.

However, this extensive study is being done ultimately to prove the inadequacy of the geometric models with respect to the real physical causes of the process. Though these differences may well be irrelevant in terms of the physical causes that produce the path of the planet, Kepler is nonetheless making a thorough check all of the possibilities that can be gotten by geometrical models. This will be further developed in chapters 4 and 5, where the paths of the planet will be changed as well as the different positions of the observers.

In Chapter 5 of *{New Astronomy}*, the LYM animation of Kepler's two oppositions represent several problems that people should be tackling by reading through, and get familiarized with the significance of the mean and apparent oppositions with respect to the changes in the position of the observer. A *{mean opposition}* is a purely geometric opposition, which Copernicus had taken, but which failed "*{by mistake.}*" On the other hand, the *{apparent opposition}* represents the actual physical observation, which is the position that Kepler takes, but which failed "*{by design.}*"

In Chapter 5, Kepler makes the crucial point of difference between the Copernicus geometric notion of mean opposition and his own apparent opposition:

"{For when Copernicus transformed the Ptolemaic hypothesis into his own general form, he supposed the observer to be stationed at some nearly motionless point near the sun, distant from the sun's own body by the entire eccentricity of the solar orb. I, however, in adapting Copernicus to the subject matter of that book (Mysterium Cosmographicum), made use of a different fiction. The observer was to be imagined as transported from that point to the very center of the solar body, and from there (that is, from the body of the sun) the departures of the planetary bodies were to be computed, moving on the same path which the suppositions of Copernicus formed out.}" (p. 142)

Thus, Kepler says that Copernicus did not at all put the sun at the center of the universe but made an adjustment for a "mean sun" to represent the center of the Earth motion. Again, Kepler is attempting to replace the geometric attachment of Copernicus to the physical account of the reality of the observation. Compare the two forms of

opposition in the animation of Chapter 5. Take plenty of time to look at the animation and describe each process extensively.

Discuss the different position and the significance of changing the position of the observer. Every time Kepler changes the place of the observer, the observer recognizes that the pathway of Mars is different, which inevitably leads him to discover that this is the wrong way of approaching astrophysics. This is how Kepler realized that he had to destroy the geometric arguments of Copernicus and Ptolemy, because this proved that no formal geometry could make the claim of having the true pathway of the planet! Again, the idea was not to look for the geometrical shape of the planetary pathway, but for the physical cause of it, that is what led him to discover the principle of gravitation.

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