COMMENTS ON THE LYM ANIMATIONS OF KEPLER'S NEW ASTRONOMY

Class with Bogotá and Buenos Aires LYM.

by Pierre Beaudry

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WEDNESDAY, NOVEMBER 16, 2006.

THE NOVEMBER 8, 2006 TRANSIT OF MERCURY,
THE THALES THEOREM
AND THE PRINCIPLE OF PROPORTINALITY

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THE NOVEMBER 8, 2006, TRANSIT OF MERCURY.

I hope that some of you have been able to make some observations of the transit of Mercury on November 8, 2006. We were unable to make any sighting in Leesburg because of raining conditions, but it might have been clear in Bogotá, or Buenos Aires. How was it? Any luck?

I hope you received the e-mail I sent you yesterday about the experiment that Rick Sanders had made with the transit of Venus, on June 8, 2004. Rick's report goes through how he used the transit of Venus to determine the distance to the Sun by the method of parallax. This involves the same principle of proportionality that Thales used for determining the height of the Pyramid of Egypt as well and for forecasting the solar eclipse of 585 BC, which put an end to the war between the Medes and the Lydians.

Furthermore, you should know that it was Kepler who forecasted the first transit of Mercury ever to be recorded, for November 7, 1631, and also the transit of Venus, a month later, on December 6. Then, it was Edmond Halley who, in 1715, described how the precise measurements of Mercury's transit could be used to determine the distance to the sun by means of determining the sun's parallax. This is what Rick is showing in his paper, using only a pair of binoculars and a black box. On November 8 and 9, the transit of Mercury represented the second of fourteen such astronomical events to occur during this century.

Thales and Kepler's forecasting were based on their knowledge of the harmonic ordering of the solar system as a whole. In each case, that knowledge provoked all of the astronomers of their time to enquire about such a scientific method, just as Gauss provoked the astronomers of his time when, using the same Keplerian method, he forecast the sighting of the first asteroid, Ceres. This is the reason why LaRouche had called on the LYM to master the scientific method of Kepler in order to be able to understand the principles involved in forecasting long waves of economic cycles. This is not an easy method to master and I hope that the principle of proportionality I am about to develop with Thales will help you go further in the same general direction. Do you have any questions or comments about the transit of Mercury?

So, let's begin with the Thales Theorem first, and after rediscovering his principle of proportionality and self-similarity, we can go back to Rick's paper on the Transit of Venus and see how he applied the same principle to discover the distance to the Sun. Now, let's go to Thales. Are any of you familiar with the Thales Theorem?

THE THALES THEOREM AND THE PRINCIPLE OF PROPORTIONALITY

[Philippines LYM, August 14, 2004.]

First, consider that the first science of mankind was derived from light and shadow reckoning. Today, modern man doesn't pay attention to these things, because he has too many other important things that distract and entertain him. So, he gets his so-called knowledge from television as if projected on the dimly lit wall of Plato's cave and he convinces himself that this is reality. Now you know why modern man has lost the exuberance of the early days of mankind.

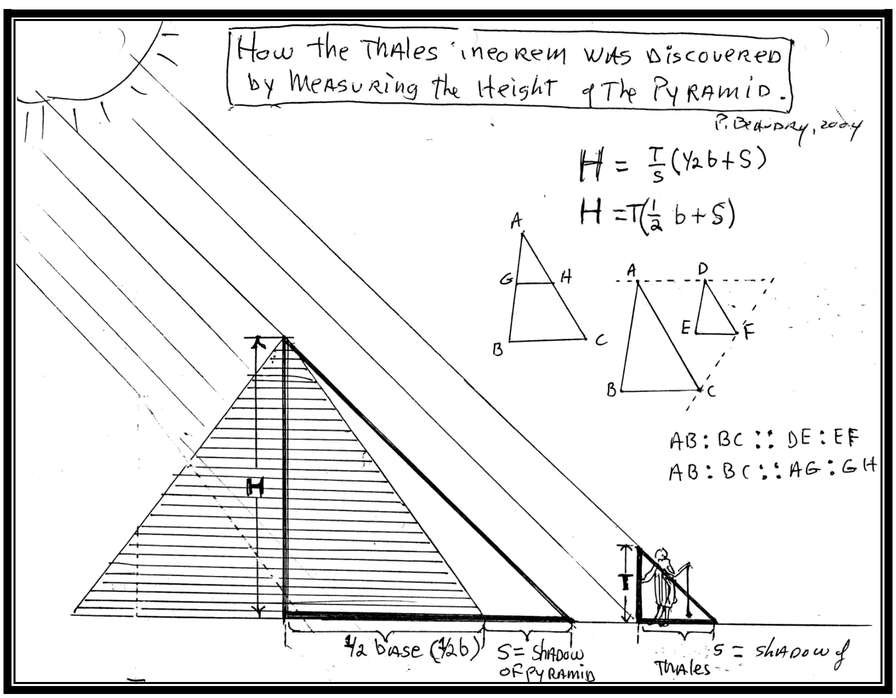
For early man, however, light and shadows were the first physical means of discovery. In all of nature, light and shadow reckoning represented the most fascinating phenomena to investigate. Why? Because man was created a rational creature and God had created his reason to serve as a sort of mirror, in which the harmony between the creation and the creator could be reflected. This is where shadows come in. If ancient man were to look at television, he would immediately ask: who is behind these shadows? What is the intention of these shadows? What do they tell us about the truth?

Man discovered very early on that the joy of concentrating on the small points of light reflected in the heavens or in water, or bright sunlight reflected in a curved mirror resembled small burning fires in his soul, burning in the resemblance of the Creator, and he realized that a burning glass was the natural image for an act of passionate creative knowledge that he was, himself, able to replicate.

So, in the cradle of civilization, light and shadow represented the most significant experiments that man could involve his exuberant mind with. How many of you have ever observed that light coming through the slits of barn boards followed an apparent clear straight line pathway through the dusty air, and that the beams of the sun appeared to travel in parallel rays, and sometimes, in triangular projections. The science of light and shadow reckoning was the great science of remote antiquity. The physical geometry of {***Sphaerics***} that is, astrophysics, was derived from shadow reckoning. The geometry of conics developed by Hipparchus and Apollonius was generated by shadows.

The first astrophysical surveys, the art of time keeping and of navigation, as well as the principle of architectural measurements, of pyramid building, and city building, were all derived from that same science of shadow reckoning. This is also how the famous Thales Theorem was devised.

Well, let us see how Thales discovered this famous theorem. Those who do know the answer don't say anything. Just help others to discover it for themselves. You see, the importance of this discovery is that it is a purely subjective question, not an objective one. So, how did Thales proceed in his discovery? Thales discovered that he was different from the animal. He discovered that his mind, created in the image of God, was capable of changing the universe, because his mind was the unit of measure of the universe, as was exemplified by the Prometheus of Aeschylus. Let me elaborate a little bit more on this.



[Figure 1. How the Thales Theorem was discovered by measuring the height of the Great Pyramid.]

Thales placed himself behind the Great Pyramid of Egypt at the precise time of day when the sun struck him and the pyramid, simultaneously, in such a way that his shadow reached a length equivalent to his height, thus making a shadow angle of 45 degrees. This is the discovery of man being the measure of the universe. This measure of one Thales = T became the measure of the Pyramid, by proportionality and similarity. This is the case because the height of Thales is to his own shadow as the height of the Pyramid is to its own shadow. Do people see this concept of proportionality? Thales only had to think of the relationship between a minimum and a maximum and say that whatever applies to the minimum must also apply to the maximum: {***this is to this as that is to that***}. Any questions?

Thus, after locating the end of the Pyramid's shadow, Thales measured how many "Thales" went into the length of the pyramid shadow **S** plus half of the base of the pyramid, which is **1/2 b**. In this unique experiment, the height of the pyramid was found to be:

$$\mathbf{H = (\tfrac{1}{2}\,b + S)}$$

However, the difficulty here is that there are only two days, in the year, when the noon shadow of the Pyramid fell at 45 degrees behind its northern face. If you know that on the plain of Gizah, at latitude of 30 degrees, the noon shadow at summer solstice is 6.5 degrees and 53.5 degrees at noon at the winter solstice, then you can find on what days Thales made his experiment. But, Thales required a further development so he could universalize a proof for all possible circumstances of any day of the year. Do you know how he was able to do that.

THE PROPORTIONALITY OF SELF-SIMILAR TRIANGLES.

Look at **[Figure 1.]** again, and study closely the similarity of triangles **ABC** and **EDF**, and compare them with the unique previous case of the shadow equal to Thales. What is the difference? The ratio has changed. So, the question is: how do you universalize this {***proof by shadow***} for any ratio whatsoever? Using the principle of proportionality and similarity, Thales put his pole **T** upright in the ground with a plumb line, in such a way that the tip of his pole cast a shadow **s** that was no longer the same length as his own height. So he lose one aspect of the self-similarity. But, nonetheless, the two shadows of the pyramid and of the pole still formed two similar triangles.

Since the two triangles **ABC** and **DEF** are similar, it can be seen that the ratios of the corresponding sides **AB : CD :: DE : EF** shall be proportional. Furthermore, the ratio of the lengths of any two corresponding sides of similar-equiangular triangles is always the same whatever their actual size. In this case, one has the following relation:

$$\mathbf{H : (\tfrac{1}{2}\,b + S) :: T : s}$$

Since the {***ratio***} of the proportion is valid for the small as well as for the large triangles, that relationship (Latin term for {***reason***}), becomes a measuring instrument, which can be used to multiply the known part of the larger triangle **[1/2 b + S]**, in order to obtain the value of the unknown part **H.** This capability is simply derived from the fact that your mind has recognized the simple relationship of {***this is to this as that is to that***}. Now, if you apply this same principle the transit of Mercury across the face of the Sun, you can discover the distance of the sun. {***This proportional projection represents a unique creative mental process, which consists in looking for the unknown part of an***

equation. The creative mind uses the known in the minimum to discover the unknown in the maximum.} This is what Nicholas of Cusa later developed. I will go into that later with the {***Isoperimetric Principle***}. It is from this same type of creative mental process that Pythagoras later investigated the function of the third side of the right angle triangle and discovered his famous {***Pythagorean Theorem***.}

However, Thales was the first known geometer to make extensive use of this {***ratio function***} in order to measure proportionality. This is the method that he used to determine the distance of ships at sea, as well as the distance of the Moon and of the Sun from the earth, as well as predicting the events of eclipses.

The point to remember, here, is that you are able to make use of the relationship between the height of an object and its shadow {***T to s***} in order to universalize the proportionality under any circumstance. All you do is you generate a function out of a {***ratio***} in the small and project it to a similar {***ratio***} in the large. This has the effect of normalizing proportionality between a known measure in the small with an unknown measure in the large. With this, you can now construct your own algebra. Since proportionality can be gotten by this self-similar angular projection, the unknown height **H** of the pyramid can, therefore, be noted algebraically as follows:

$$\mathbf{H = T/s\ (\tfrac{1}{2}\, b + S)}$$

THE TRANSIT OF VENUS

Now, let's go back to Rick's study of the transit of Venus for June 6, 2004. Rick used the same principle of proportionality to determine the parallax of the Sun and establish its distance.

FIN

PART II.

THE ARCHYTAS CONSTRUCTION FOR THE DOUBLING OF THE CUBE

"YOU ARE MY CHOSEN PEOPLE!"

Let me address something very special about the Jewish people and why they are so special. In his book, {***The Kuzari***}, Judah Halevi wrote that when Bulan, the King of the Khazars, converted to Judaism, he had asked the Rabbi why the Jewish people were the {***chosen people.***} The Rabbi answered that it was in order to make the difference between man and animal! He also showed that the distinction arose when someone recognized that the {***chosen people***} were those who did not consider that God created the world for their own sake, but for the sake of all of mankind; then, the chosen ones became universal souls as opposed to predatory creatures. So, this is the way the Jewish people resemble God, not from the standpoint of perception, or imitation, but from the standpoint of God's divine characteristics. Now, how do you know if this is true or not? You know it because every new paradox that you solve increases your power over the universe. And the Jewish people have to resolve paradoxes all of the time.

Therefore, the Mosaic principle of man created in the likeness of God is not based on religious faith at all, but on the scientific recognition of the difference between man and animal; and as a result, man should never be treated as an animal, because between them, there is the difference of an irony that animals cannot understand. It is precisely this type of irony that Nazis and fascists like Cheney and Bush do not understand. It is precisely this type of irony that created the special relationship between the Prophet and the Israeli people in the first place, and between Israel and mankind afterwards. Let me give you an example of how this works. Let me tell you the story of the young Jewish schoolboy, Moishe.

In school, Moishe was always chosen by his blind teacher to do a public reading before the class, simply because he always did it so well. However, one day, Moishe got tired of being chosen and decided to go and hide in the back of the class. The teacher came in and said: "OK, open your book at page ten, and Moishe, please, start reading." Then, there was a heavy pause of silence. "Where is Moishe?" The teacher asked. "Why aren't you reading?" After a second pause, Moishe answered in a high pitch voice from the back of the room: "Teacher, Moishe is not in school today!" - "All right," said the teacher, "then, you do the reading!" You see, that is how the chosen people are chosen: God chooses people because they have a talent, and they have a talent because God chose to give it to them and not to animals.

In Part I, Section 102 of {***The Kuzari***}, Bulan-Khazari asked the Rabbi: "{***Would it not have been better or more commensurate with divine wisdom, if all mankind had been guided in the true path?***}" The Rabbi replied by going directly to the axiomatic issue and answered back by asking the totally provocative question: "{***Or would it not have been best for all animals to have been reasonable beings?***}

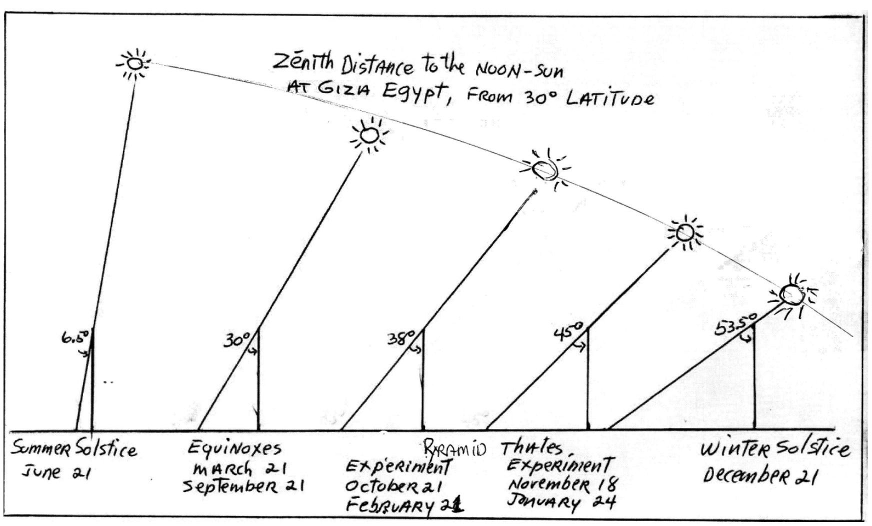
Thus, the chosen people of Israel became the instrumental cause of the good in the universe; by choosing to act differently from predatory animals, and only to the extent that they acted in accordance with this axiomatic difference between man and animal, which is to act as a historical being, as an immortal being, out of love for mankind. This is what the Khazar Kingdom was all about during their ecumenical alliance with Charlemagne and Harun al-Rashid, during the first part of the 9^{th} century. The Khazars represented the first international application of the principle the {***Advantage of the other***} of the Peace of Westphalia, the germ of the American System of Political Economy.

Now, consider the following form of measurement between animal, man, and God. What if I establish an incommensurable difference of species that says: {***animal is to man as man is to God***}. Does that make sense? Is that an appropriate and intelligible proportionality? What if I expand this into a double proportional relationship such that I say: {***The Abiotic is to the Biotic as the Biotic is to the Noetic in the same proportion as the Noetic is to the Divine***.} Is that a Divine Proportion? Is this not the "fourth domain" that Lyn speaks about when it subsumes the other three domains proportionately? As Lyn indicated, the chemistry of the living cannot be found in the non-living. Similarly, the chemistry of human cognition cannot be found in animals, yet, all four domains interact with each other. That is what civilization started from. This is what Thales, Pythagoras, and Plato called {***Hylozoic Monism***} in which the intention of the universe as a whole was expressed as a {***single living principle of change***}. "You never bathe twice in the same river," said Heraclites.

SHADOWS, SHADOWS, AND SHADOWS.

So, how can this be expressed as a dynamic incommensurable relationship? How can such differences of power be expressed as the difference of powers between the line, the surface, and the volume? I was happy that Juan Alejandro had raised that question of Aristotle because I would not have had the opportunity to recall what Aristotle had said in his Astronomy, and I would not have rediscovered how much Aristotle hated the discovery of Archytas doubling of the cube.

How can we find such a proportion simply by looking at the perceived Egyptian shadows? How can these simple angular forms act as appropriate incommensurable metaphors for what we are trying to measure? First, take the illustration I sent you last week ago on the different shadows projected in Egypt, at the latitude of 30 degrees, and relate them to this question of incommensurability between the Heavens and Earth. What do these shadows tell you? Establish the boundary conditions for your sense perception observation and apply to them the Dirichlet Principle.



[Figure 2. Shadows at the latitude of 30 degrees in Egypt between the two solstices.]

One of the first crucial steps the Egyptians took in the investigation of the heavens consisted in using angular measurements of celestial phenomena and they reflected on the nature of their relationships between human intelligence and the intelligence in the heavens, that is, the proportionality between man and God. They began with relating the fixed stars with the axis of the celestial sphere, the apparent movement of the Sun during the year, and the relative position of the Pyramid of Egypt on Earth, vis-a-vis the Sun and the North Star. This was an early form of seeking to discover a solar calendar, otherwise known as the astrolabe, but without making its actual discovery.

So, with latitude at 30 degrees, the positioning of the Great Pyramid of Egypt was determined from the Pole Star, and then the range of the Sun's apparent motion was between 6.5 degrees at Summer Solstice (June 21) and 53.5 degrees at Winter Solstice (December 21). How did they arrive at that conclusion? What determined those angles and that range? The most important discovery was that of the Zenith Function, that is, the determination of a non-existent point above your head, located on the heavenly sphere, and which represents your location with respect to the entire universe as a whole. That is the position of the scientist on the surface of the heavenly sphere. Now, if you project a ray from that Zenith point over you head perpendicular to the site of the Great Pyramid in Egypt, where you stand, your Zenith distance to the Celestial north pole is 6o degrees. This means that when your Zenith distance to the North Pole forms a right angle with the position of the Sun at noon, then, you are on the day of the Equinox, and the Sun is crossing the equatorial circle of the celestial sphere.

In **Figure 2**., the Zenith distance to the Sun is chosen to determine the angles at noon. The point to be made here is that if you know your Zenith distance to anything in the universe, at any time night or day, you can never be lost! Secondly, establishing the minimum and maximum angles between the Zenith distances to the sun at noon on the days of summer solstice and winter solstice, and comparing them with the Zenith angles to the Sun at the equinoxes, determines and locks in the range of the yearly cycle of the Sun.

That also gave the Egyptians the four markers for the orientation of the Great Pyramid, and, to their surprise, the difference, year after year, was, in each case, always the same angle. Thus, the Egyptians had found a normalizing mean of establishing an astrophysical solar calendar. The year cycle was of 360 days (or 360 degrees), that is, twelve months of 30 days each, and three seasons of 4 months each. The added 5 and ¼ days remaining were gifts from the gods that were not accounted for in their common calendar.

Now, let's look at the significance of those shadows. No matter what year it is, the angle between the maximum and the minimum is always, invariably, 47 degrees. One interesting feature of this is that on the days of the Equinoxes, on the plane of Giza, the Zenith distance to the Sun at noon is 30 degrees, while the Zenith distance to the North Pole is 60 degrees, which means that, at the location of the Great Pyramid on the days of the Equinoxes, all of the gnomons form shadows that relate to the equilateral triangle as well as the scalene 90, 60, 30 degrees right triangle. This shadow reckoning should also be experimented by the LYM of Houston, because their latitude is also 30 degrees (or to be more precise, 29.97 degrees). How does that relate to the so-called Platonic solids and to the Great Pyramid? Also, how does that relate to the boundary conditions of the Sun's yearly cycle of the Ecliptic? The question is, how do you find the location of the Ecliptic in the heavens? How can you find that pathway of the Sun during the entire year, when all you see are the time lapse snap shots of the Sun following a straight line up and down in the blue sky above, which are merely lies derived from more lies?

What is the significance of this sort of animation? What does it tell you about the motion of the Sun around the universe, or the Earth around the Sun? This locates the second most important non-existing point in the heavens after the Zenith Function, that is the crossing of the Celestial Equator by the Sun at noon on the day of Equinox. Now, what is the significance of this intersection? Remember, you can only imagine the pathway of the Ecliptic and you cannot see the pathway of the Celestial Equator, yet you can know the angle between the two. How can you do that if you can never see them? How can you determine the angle between two things you don't even see? You don't see those two curves, because they don't exist; yet you know that the angle of their intersection is 23.5 degrees!! In other words, the angle between the extremes of 6.5 degrees on June 21, and of 53.5 degrees on December 21, is always 47 degrees and you know that half of that angle is 23.5 degrees, which establishes the angle of the two Equinoxes at 30 degrees at the Great Pyramid, because 23.5 + 6.5 = 60 divided by 2 is equal 30 degrees.

So, now that you have established the angle between two invisible things, you have now two new markers, representing the days of this special invisible intersection, March 21st, and September 21st, the days of the Equinox. This is the way the Egyptians locked-in the astrophysical pathway of the Sun during the calendar year of 360 days. This is a major astrophysical discovery, because they were able to create a {***stereographic mental mapping of the motion of the Sun***} moving around the universe as a whole. Then, all they had to do was to find the right projection from the sphere of the heavens and connect it with the plane. This was a greater task that was accomplished by Hipparchus. The great incommensurable relationship between the sphere and the plane began to be resolved. Again, the celestial sphere had to be projected against the wall of Plato's cave, that is to say, onto the discrete manifold of the visible domain?

But it gets more complicated. Just when they thought they had pinned down the Equinoxes and the Solstices, the Egyptians discovered that these points were also moving. They noticed that the equinoxes were moving, year after year, in an opposite direction, that is, from East to West during a very long period of about 25,920 years (one degree every 72 years), which they called the {***Precession of the Equinoxes***}. That was another crucial non-visible and incommensurable Riemannian type of relationship. The {***Precession of the Equinoxes***} represented a similar higher dimensionality as did the doubling of the cube with respect to the doubling of the square; which is why it is entirely feasible that the doubling of the cube was first discovered in ancient Egypt, before it was discovered in Greece. But we have demonstrated that a month ago.

Indeed, not only the Egyptians had to account for the time of the apparent motion of the Sun during the year, but also they had to account for the time that the Sun traveled around the Universe during a period of 25,920 years. This created an infinitesimal difference between sidereal time and earth time for every second of the day. It appeared that there were no longer any means of establishing any fixed parameters outside of discovering what the ordering principle of change in the infinitesimally small higher dimensionality was all about. This became the Kepler challenge that was later taken by Leibniz and his calculus. As a result, the Egyptians began to realize that the sidereal day was shorter than any infinitesimal moment of the smallest part of each second during one revolution of the Earth.

So, to sum up what I have said, those shadow angles of **Figure 1.,** are not merely fixed reflections, or traces of the daily positioning of the Sun. They also reflect the limit of the year and the boundary condition for the {***Precession of the Equinoxes***}; neither of which have visible curvatures! So, here is the problem: how can you map the curvature of the Ecliptic, that is, the pathway of the Sun during one full year, if all that we see are the daily-snapshots of the yearly traveling of the sun, at noon? However, are these snapshots not pointing to its curvature like the slow time-lapse sequence of an animation? Don't we get into a nice little ambiguity here, because of the Ecliptic and because of the {*Precession of the Equinoxes*}? The next question has to be: how did they determine the curvature of the Ecliptic cycle for an entire year? How did they express the non-visible curvature of the Sun's yearly cycle by means of {*Sphaerics*}? This is not just the apparent motion of the Sun going around the Earth. This is the non-visible motion of the Sun going around the Universe as a whole in coordination with the motion of the rotating axis of the Earth with respect to the Celestial North Pole. This is as the infinite motion of simultaneity of eternity. How do you make that visible in a way that is a true representation and not a sophistical fallacy of composition? If you find the answer to that question, you have found the solution to the paradox of the astrolabe of Hipparchus.

In their study of shadows, the Egyptians noticed the discrepancy between the projection of light from a sphere, and the flat shadow that was cast onto a plane, as in a Sundial. That relationship between the sphere of the heavens and a plane on the earth became the first solid geometry paradox of ancient Egypt. The paradox was: how do you project a curved surface onto a plane surface? How can a sphere be represented onto a plane? How can the incommensurable relationship between the two be normalized? That problem had been a very puzzling and perplexing paradox from the very beginning of astronavigation and it is very difficult to determine exactly when it was actually resolved. I will later submit a hypothesis that the solution may have been found when Hipparchus created the astrolabe during the second century BC, and is said to have discovered the {***Precession of the Equinoxes***}. It may have been discovered before that, but, so far, I have not met with much satisfactory evidence.

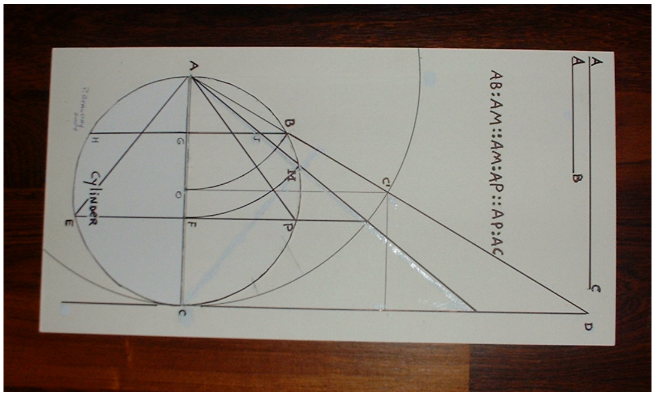
Indeed, if you project a light from the center of a transparent sphere, all of the curved lines on the surface of the sphere will appear as straight lines when projected onto a plane ceiling! However, if someone tried to see the difference between the sphere and the plane by squishing half of a hollowed out orange or grapefruit onto a plane, you would rapidly discover that you have a very messy situation on your hands, because it simply doesn't work. The two surfaces are incommensurable. Ahhh!!!

Here we are, again, with the problem of incommensurability between two geometric species. How did the Egyptians and the Greeks discover a way to measure curvedness and straightness at the same time? The Egyptians invented the conic section that came to be known as the compass or the conic angle divider. They realized that any measurement with the conic section of a compass enabled them to solve the paradox between curvedness and flatness. Indeed, measuring angular distances with a compass generates the same result on a curved surface and on a flat surface. So, what appeared to be impossible became possible with the use of the compass. This is the reason why the Classical Greeks established that everything they could construct in geometry had to be done with a compass and a straight edge alone. So, it is important to reestablish that tradition of the conic function. Therefore, the question is, how does an angular projection make possible what appears to be impossible? How could a conic projection solve the paradox of incommensurability between the sphere and the plane? Now we are ready to discuss the Archytas problem of doubling of the cube. Any questions?

3. THE DOUBLING OF THE CUBE BY ARCHYTAS

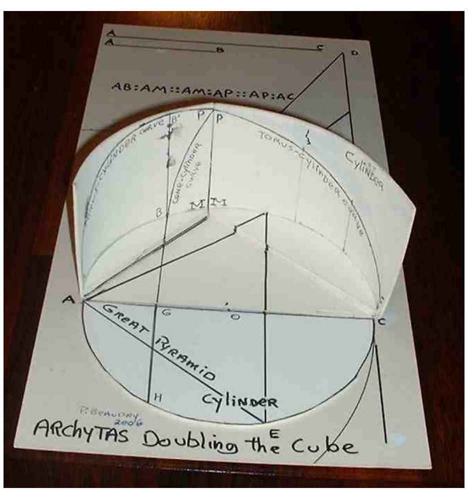
The first thing you must avoid when you are first introduced to the Archytas doubling of the cube is the trap of fumbling all over the cone, the torus, and the cylinder, as if they were things in and of themselves. They are not. They are visual traps. What you must do, immediately, is to look behind the visible domain and reach out for the principle of what Lyn has always identified as multiply connected circular action. The reason you want to concentrate on intervals of circular action is because they always express the principle of least action in some form of proportionate way. For example, the difference between the doubling of the square and the doubling of the cube is proportional to the difference in the circular action that is required between determining one mean between two extremes and two means between two extremes. This is the way that proportionality of different actions brings closure to the physical boundary conditions of a change in power in the physical universe. Therefore, the doubling of the cube will require a doubly connected circular action, and the way to discover that is by way of a stereographic conic function of projective geometry. The idea to be grasped, here, in this whole construction, is to generate the solution by both an orthographic and stereographic projection of the conic function as indicated by Lyn. How do you do that? Let me describe this by constructing a workable Archytas model that you can use in your deployments.

Start with the same white cardboard material as you did before, with the Egyptian model, and establish a baseboard 23 cm by 45 cm. Draw the appropriate circle and conic triangle lines exactly as in the previous Egyptian model. The crucial difference, here, between the two models is that Archytas transformed the double conical projection of the Egyptian Sphere into a Cylinder on which he generated two bold curves by means of a Cone and a Torus. So, instead of drawing the great circle of a sphere, start by drawing the base of a cylinder with an 18 cm diameter. Determine all of the same parameters as in the previous construction. Draw all the same lines and angles and use the solid shadow of the previous Egyptian construction as the {***necessary predecessor***} to the Archytas construction to draw the shadow-line AMD'.



[**Figure 2**. **Construct the baseboard of the Archytas construction.]**

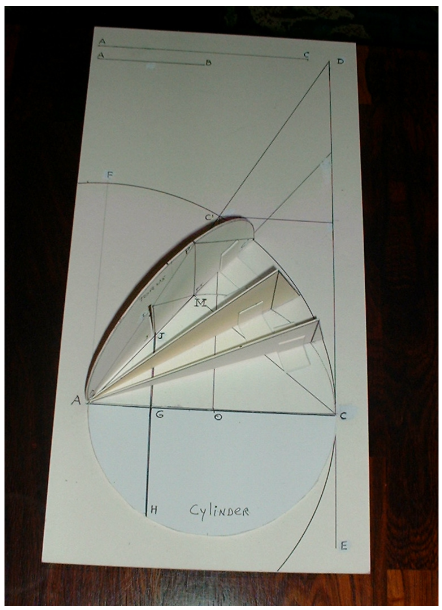
Construct two parts of a half cylinder whose height is 9 cm. Draw on each part the letters identifying the different points of the base board, that is, A, B, M, C, then line BB' and BJGH. Next, construct the two bold curves of the Torus-Cylinder and the Cone-Cylinder and establish point P as the intersection singularity of four degrees between the two double curves. Think of the intersection of those two bold curves as the traces of two circular actions generating a single unity of effect that is stereographic in character. Then, think of the Torus-Cylinder Action separately from the Cone-Cylinder Action. They are both constructible only by circular angular rotation. The reason you want to start with the construction of the Cylinder is that this is the only one of the three solids that is not moving, and it is the only solid on the surface of which the two bold curves can be traced.



[**Figure 3**. **Construct the Torus-Cylinder curve on a half-Cylinder.]**

THE TORUS-CYLINDER ACTION

Construct the half circle of the Torus as you did the Cylinder base, with a diameter of 18 cm. The two circles have the same diameter. Starting from an initial position at AC, rotate the Torus half-circle one full circumference around the fixed pivot point at A. Trace a quarter circumference on your baseboard and note that the Torus half-circle motion intersects the Cylinder at every point of its wall. Construct the stereographic image of that Torus-Cylinder curve. The motion of the Torus is leading toward a point of singularity, point P, which is the only point that intersects simultaneously the three surfaces of the Cone, the Torus, and the Cylinder! There is no other point, anywhere in that whole complex construction which intersects the three surfaces all at once. Everywhere else, the surfaces of the three solids only meet two by two. So, the question is, can you find in the Torus-Cylinder Action any reason to stop at point P? The answer is no.



[**Figure 4**. **Construct the Torus half circle and two animation tracers.]**

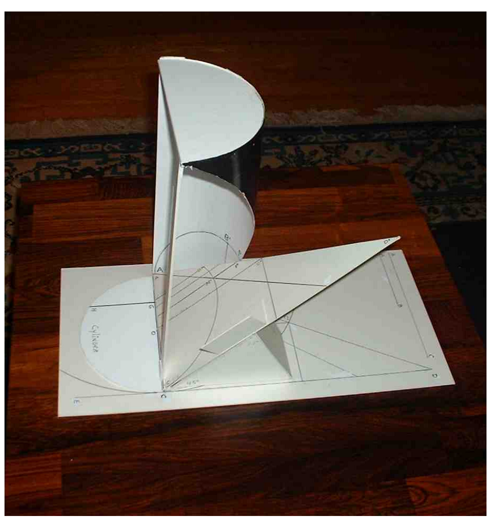
When you rotate the Torus half-circle, perpendicular to the base circle of the Cylinder, you see in your mind the trace of a bold curve, as it has been called, on the surface of the Cylinder, and as Bruce and Jonathan have demonstrated in their own pedagogical. The curve has been called "bold" because it is daring, because it is the coastline that rises "bold" between the two domains of Euclidean Flatland and the domain of Pythagorean Sphaerics. This bold curve is a double Torus-Cylinder curve; meaning that it traces the shadow-contact of the two surfaces as the motion of the Torus half-circle constantly intersects the fixed surface of the Cylinder in its angular rotation. As you follow that trace on the Cylinder, imagine that the same trace is moving slowly on the circumference of the Torus half-circle, from C toward P. Now, consider this curving action as an {***axiomatic change indicator***}, for it has no other meaning than to trace the shadow leaving point C and moving toward the singularity of point P as if it were tracing the pathway of the axiomatic change between the doubling of the square and the doubling of the cube.

You can easily establish this curve by having the Torus half-circle stop anywhere you choose along the base of the Cylinder and trace two other different positions on two animation tracers that will reflect the positions of two different points on the Torus-Cylinder curve. [**See Figure 4. Torus-Cylinder Curve.]** Bear in mind that what is special about that point P is that it is the point where the Torus and the Cylinder meet the {***conic function***}. Ahhh!!! So, there you have it. There was a reason for the Torus-Cylinder Action to stop at P, and that reason is to be found in the cone. So, there must be a second {***bold curve***}, generated by the Cone-Cylinder Action of the {***conic function***}, and which will contain the reason why the Torus-Cylinder curve must stop at P. This is where the Egyptian missing link comes in. How can we construct that?

It is essential to discover this point by a construction process and not simply assert its existence by intuition. The reason why it is necessary to go through the constructive proof of a discovery is because a so-called intuitive proof is a front for a false underlying assumption. This is the reason why Bernoulli, for example, wrote a letter to Newton, urging him to send him his method of construction for the catenary curve, because Newton was flaunting his solution without showing what was behind it.

Of course, Newton never sent him his method of construction for the catenary because he had copied the answer from the back of Leibniz's book. So, you see, Newton was hiding behind his "intuitive proof" because he had not found it by construction and he wanted to use that cover as a means of exercising authority and power over people. That is the underlying assumption, which is hiding behind an intuitive proof, and that is why you must always provide a constructive proof in everything that you do.

THE CONIC-CYLINDER ACTION



[**Figure 5**. **Construct the scalene conic section and the Cone-Cylinder curve on a half-Cylinder.]**

Lastly, let us construct the bold curve of the {***conic function***}. Rotate the scalene conic section through the entire half-Cylinder. That 90-degree rotation generates a quarter of a cone whose axis is hinged at AC in the plane. Now, as you elevate the tip of the scalene-conic section around the axis AC, the quarter conic rotation traces a curve along the entire surface of the half-Cylinder up to a maximum point at D'. Cut the Cylinder along that Cone-Cylinder curve. This last step shows why the whole process of the double circular action stops at point P on the Cylinder. It is because this angular elevation is a mixture of 45 and 38 degrees, that is, {***the angular difference between doubling the square and doubling the cube!***} That was the crucial singularity to be discovered. That is the singularity where the crucial discontinuity of a change of power between the plane and the solid becomes intelligible to your mind's eye.

As a result, point P becomes a {***quadratic singularity point***} intersecting four surface contacts: two between the Torus and the Cylinder surfaces and two between the Cone and the Cylinder surfaces. In fact, this is the only {***quadratic singularity point***} in the entire Archytas model. This point of discontinuity could also be likened to a thermodynamic phase-space transformation between solid, liquid, and gas. As Lyn often demonstrated, and as the current crisis-point in history also shows, a point of high density of singularities represents the turning point of a physical axiomatic change. So, the significance of point P is that it acts as a catastrophic shock-effect point, or as a turning point of opportunity, at any rate, as a change of power, a Riemannian change of geometry. That is what point P is all about. It is an axiom busting point of four degrees, something like a four-degree osculation that Leibniz talked about in his {***Acta Eruditorum***} papers.

Thus, point P determines the summit of the orthographic shadow-line PM, along the Cylinder wall, which establishes the two cubic roots, AM and AP, corresponding to the sides of two cubes that respectively double and quadruple the initial cube whose side is AB. It is also interesting to note that these two cubic roots also have a certain correspondence to the Lydian musical conic function, which divides the octave by half and half of the half in the logarithmic spiral action of the well-tempered system. Most emphatically, however, this passing from the domain of the square roots and the cubic roots leads directly to the crucial point made by Gauss in his 1799 polemic against d'Alembert, Euler, and Lagrange and their "fictions" of imaginary roots. The Archytas construction obviously provides Gauss with the constructive proof that there is an axiomatic difference between shadow and "{***merely a shadow of a shadow***.}"

Thus, Archytas established the two mean proportionals that were required to be found between two extremes in a ratio of 2/1. Such is the {***quadratic proportionality***} of the conic section where **AB : AM :: AM : AP :: AP : AC.** That is the pivot of the {***quadratic conic function***} that Lyn identified as the key that unlocks the Archytas theorem, and which brings it in congruence with the Pyramid of Egypt, where {***the height of the Great Pyramid is to its apothem as two mean proportionals are to the doubling of the cube***.}

FIN PART II, July 22, 2006.