(A pedagogical experiment in universal history) PART IV

THE EGYPTIAN SCIENCE OF SHADOW RECKONING AND THE DOUBLING OF THE CUBE. BY CONIC FUNCTION

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(Class of constructive geometry for the Philippines LYM. 8/19/2006.)

1. THE ROLE OF DISCONTINUITIES: CUSA AND THE ISOPERIMETRIC PRINCIPLE OF LEAST ACTION.

> **{The Baby-Boomer generation, which was brainwashed in the theory of Norbert Wiener, John von Neumann, actually all coming from Bertrand Russell, this generation is intrinsically, with a few personal exceptions, is intrinsically incompetent in science. They no longer believe in a scientific principle, a physical principle, they believe in a mathematical formula. And a mathematical formula is never more than a descriptive approximation of the effect of a principle, rather than a representation of the principle itself. That is, people believe that you derive scientific principles by deduction, or similar kinds of methods. They do not understand that you can discover a scientific principle, {only} by experimental methods. And experimental methods which show a discontinuity, which show the existence of a principle which is contrary to how you believe the universe worked before then." [Lyndon LaRouche, {*ONE OF THE ACCOMPLISHMENTS OF THE 20TH CENTURY IS TO TRANSFORM US FROM EARTHLINGS INTO SOLARIANS*}, morning Briefing, August 14, 2006.]**

In the wake of his groundbreaking book, {***Learned Ignorance***}, published in 1440, Nicholas of Cusa made the most important discovery that set the stage for all future development of modern science. Cusa's discovery became known as the Isoperimetric Principle of Least Action. A number of years ago, Lyndon LaRouche recognized the key role that such a discovery of principle had to play for science. He said: "{***Cusa presented a way of thinking about physics, which set the stage for the later work of such leading figures as Leonardo da Vinci, Kepler, and Leibniz. Every step of fundamental progress***

in experimental science since, has centered around discovering mistakes, called ‘anomalies,’ in generally accepted scientific doctrine.}”

I wish to reemphasize the importance that Lyn highlighted about the role of those mistaken “anomalies”, in experimental science and in art, as expressions of physical geometric singularities of economic processes. The purpose of anomalies is to change the universe as a whole, and this purpose is achieved when these anomalies cause three very noticeable changes in us.

First, an anomaly embarrasses our mind’s pretensions of ever achieving absolute, positive, or mathematical knowledge about the universe. Secondly, a discontinuous anomaly leads our mind to discover, with surprise, the underlying assumption that led to the crisis-point where the anomaly appeared, and forces us to change the underlying assumptions that led that anomaly to emerge at that point in the first place. Thirdly, true anomalies are ironies, and that is why they create optimism and laughter, which, as Rabelais put it, is the proper characteristic of man. Thus, with these three functions, {***perplexity, awesome/surprise, and laughter***}, anomalies cause new breakthroughs that improve the human condition and change the universe as a whole.

Here is how Cusa identified the anomaly of his Isoperimetric Principle, for example. He said: “{***The relationship of our intellect to the truth is like that of a polygon to a circle: the resemblance to the circle seems to grow with the multiplication of the angles of the polygon…But, no multiplication of its angles, even if it were infinite, will make the polygon equal to the circle***.}” (Nicholas of Cusa, {***Learned Ignorance***.})

Thus, the isoperimetric principle of Cusa became the first historical pedagogical attempt to formulate a physical least action principle. He attempted this by means of establishing a maximum and a minimum, that is, by defining the largest possible area with the smallest possible perimeter. However, Cusa’s principle was formulated negatively in that it was not accessible by positive identification of sense perception, but only through learned ignorance. And so, circular action became the only form of self-evident action in the universe, and which was generated from the inside of it. In his paper on Metaphor, Lyn addressed the same issue by emphasizing that “**{*Circular action is defined simply (negatively) as the least action of closed perimetric displacement required to subtend the relatively largest area. (Thus, the Fermat-Huygens-Leibniz-Bernoulli principle is already implicit, “hereditarily,” in Cusa’s discovery*.)}**” (Lyndon H. LaRouche Jr. {***On the Subject of METAPHOR***}, Fidelio, Fall, 1992, p. 20-22.)

During the breakthrough of the Italian Renaissance, especially after Leonardo da Vinci had applied this principle to his works in physics as well as in art. This was expressed most strikingly by the treatment that Leonardo made of it in the {***Last Supper***}. Later, it was Kepler who best exemplified this approach of minimum-maximum discontinuity with his unique {***Snowflake***} paper, applying his method of positive and negative curvature to spherical close packing. This led directly to applying the isoperimetric principle to the isochronic property of light propagation as Huygens, Fermat, Leibniz, and Bernoulli developed later with the totochrone and brachistochrone constructions, thus adding to the isoperimetric principle an isochronic feature that led Leibniz to ascribe both {***isoperimetric and isochronic characteristics***} to his Catenary function.

2. THE IDEA OF THE MINIMUM-MAXIMUM BOUNDARY CONDITIONS.

For Cusa, the {***minimum***} was always expressed by the extension of perimetric action creating a boundary or perimeter condition as a whole, while the {***maximum***} was the largest enclosed area of confinement. For example, the perimetric action producing the equilateral triangle was represented by a minimum inscribing circle and a maximum circumscribing circle, thus defining a dual limit at the two ends of the process.

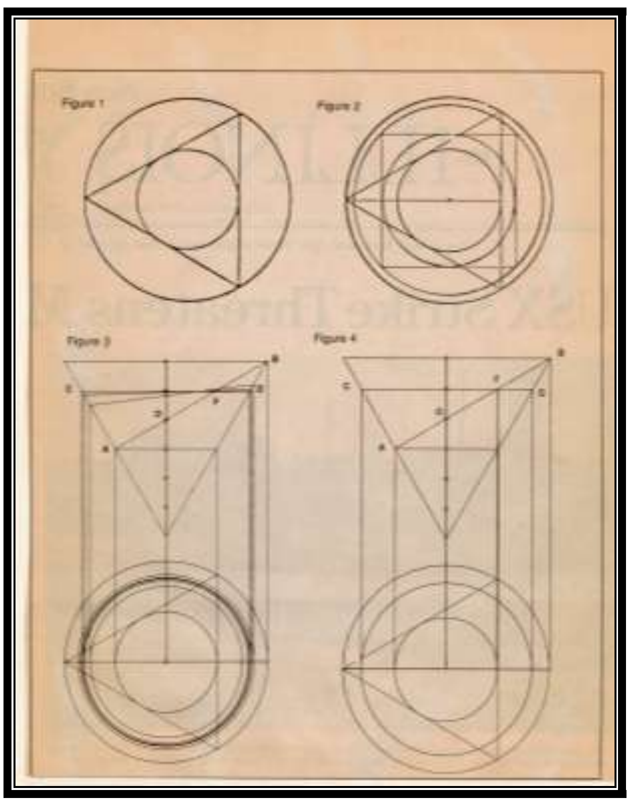

Figure 1. [Inscribed and circumscribed circles of the equilateral triangle.]

The minimum-maximum isoperimetric boundary conditions are thus set in the ratio of 2/1. This is always the required ratio, as the Delian problem for the doubling of the cube showed to be the case. The idea of "isoperimetry" itself is derived from a simple anomaly experiment, which consists in using the same (***iso***) perimeter for all polygons whose number of sides appears to be converging toward a circle. For example, do this simple experiment. Take a string of a given length, and tie the two ends. Take three pushpins and make an equilateral triangle with it, then make a square with four pushpins, then a hexagon with six, and so on, etc. How many push pins would you require for a polygon that has so many sides that it should be considered a circle? That is the simplest way to construct this paradox. From there, let's look at the fallacy of the polygon becoming a circle.

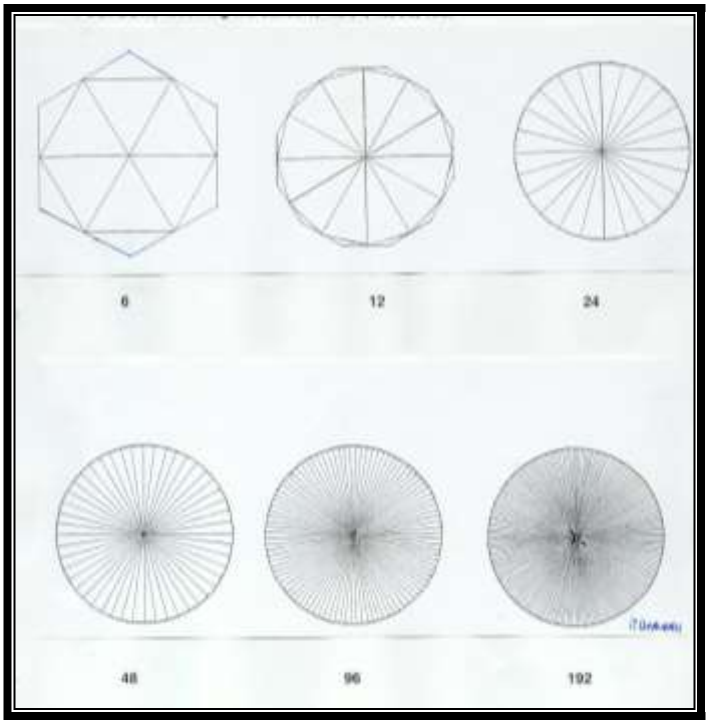

Figure 2. [The fallacy of the polygonal circle]

One glance at **Figure 2** and you immediately realize what the nature of the problem is. Let us say that you draw a hexagon inside and outside of a circle and you increase the number of sides of the polygons from 6, 12, 24, 48, 96, and 192 sides. The inscribed and circumscribed polygons of 192 sides will very closely resemble a circle, but will it generate a circle? In their fallacy of composition, mathemagicians have succeeded in squaring the circle in this manner because they found the value of $\pi = 3.1416$, to be the arithmetic mean between the inscribed polygon and circumscribed polygon of 192 sides.

You can calculate this fallacy yourself. The relative value of π for these inscribed polygons are as follows:

Π-6 = 3.0,
Π-12 = 3.1058,
Π-24 = 3.1326
Π-48 = 3.1393
Π-96 = 3.1410
Π-192 = 3.1414

And, if you circumscribe the same circle with a similar series of regular polygons, their corresponding values for π will be as follows:

Π-6 = 3.4641
Π-12 = 3.2154
Π-24 = 3.1596
Π-48 = 3.1460
Π-96 = 3.1427
Π-192 = 3.1418

For all intent and purposes it looks like these mathemagicians have created an apparent equivalence between the area of a 192-sided polygon and the area of a circle. Can this be true? If this is true then, why did Lyn say: "{***In the instance of squaring the circle, the paradox is, that the more successfully we estimated the square area of the circle, the more extremely we prove the {non-congruence} of the polygonal perimeter with the circular circumference. 'The more we appear to succeed, the more we truly fail,' might be the image of 'a true paradox.'***}"

Providing we see it, this true paradox is a very important irony because it puts us into a total state of perplexity from which we think we are never going to come out. How can you argue against it? It is so obvious. Here the general population is split. You have those who believe that what the mathemagicians said is true, that is the majority, and you have those who believe that what Lyn said is true, those are the few. However, how do you know who is right? Do you just pick a side and become a true believer? So, at that point, you need to do a physical experiment. What kind of experiment can that be? Do you take a vote in the class, and see how it works out? If you do, you may no longer want to go through with this experiment, and you might cry out like Panurge that you don't even want to raise this issue and you want to turn back, go home, and continue to do things the way you always did before.

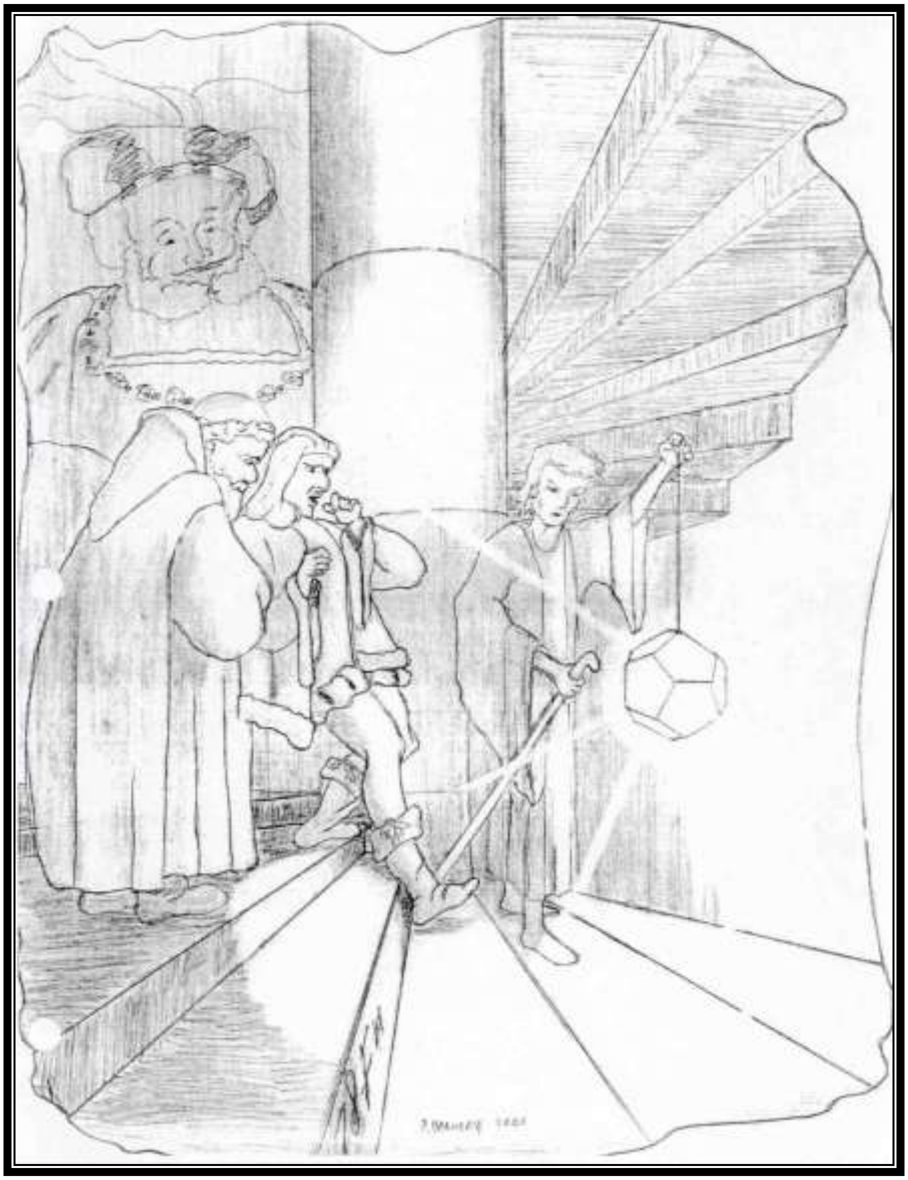

Figure 3. [Panurge's "Great Fright."]

This is what I call a crucial Rabelaisian moment. It is like when Panurge, going down into Plato's Cave, became overwhelmed with total fear at the point of reaching the spiral Pythagorean step seventy-eight, that is, the Pythagorean "Tetradic wolf tone" of the comma, at which point Panurge went into a delirious inversion, thinking that he had heard the Cerberus dog barking. And he said: "{***I've no liking for him at all, for there's no toothache so bad as when a dog has got you by the leg***.}" [Francois Rabelais, {***Book V***}, Chapter 36: {***Our Descent of the Tetradic Steps; and Panurge's fright***.} So, what Rabelais is describing, here, is the same discontinuity of an axiomatic change, the location of an irony that Lyn is talking about when he says: {***'The more we appear to succeed, the more we truly fail.'***} You see, that perplexed inversion is very useful to examine, because this where the principle makes itself known between the cracks of the universe. So, let's get back to Cusa and study that discontinuity more closely.

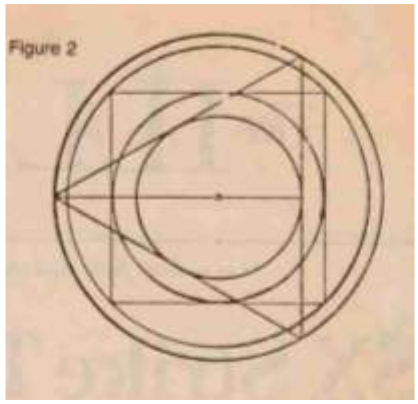

Figure 4. [Inscribed and circumscribed triangle and square]

The concentric triangle and square show how the anomaly is constructed. When you overlap the equilateral triangle with a concentric square, and when the perimeter of the square is the same as that of the triangle**,** something very interesting emerges from within the shadows. The inscribing circle of the square is larger than the triangle's inscribing circle, and the square's circumscribing circle is smaller than the triangle's circumscribing circle! Well, well! What does that tell you?

{*This tells you that by multiplying the sides of the polygons, while maintaining the same perimeter, a repeated series of inscribing circles of the different polygons would grow larger toward a maximum, while an iterative process of circumscribing circles would grow smaller toward a minimum. What is the significance of that?* } Is it possible that, somewhere, between the two converging processes, there must exist a limit circle into which those two interdependent iterative progressions must coincide? Does that mean that we have found an actual isoperimetric circle towards which all polygons tend? Can that circle be the absolute maximum polygon? Are we not back into our perplexity again, trying to find a comfort zone?

No! There is no such isoperimetric circle. Sorry, there is no comfort zone. Again, our perplexity must persist before another paradox, until we become willing to bust the axioms that led us to that comfortable, but untrue, state of affair. Did you really think that by going into some sort of conic function we would be able to divert the attention sufficiently to discover the existence of that elusive isoperimetric circle? This is not a Jesuit trap! What is missing, here?

What is missing is that we have not even looked yet into the underlying assumptions that are behind this fallacy of composition? So, oblivious before the obvious, we tried to prove that the isoperimetric circle must exist, one more time. And, one more time, we failed. So, after this second failure, I think it is time to start looking for what keeps generating that renewed state of perplexity. What keeps leading us into believing that a polygon could become a circle? Why are we so obstinate in our repeated mistakes? What makes us believe that one species could be transformed into another species, that an animal could become a man, that the polygon could become a circle, or that man could become God?

This perplexing absurdity of a polygon becoming a circle has tremendous implications, but where does the problem come from? What is the wrong underlying assumption, here? Think about that, for a minute, and let me know what you can come up with? What is an underlying assumption anyway? Let’s start with that with that question.

Figure 5. [Panurge discovering that an underlying assumption is always covered up.]

What sort of underlying assumptions do you see here? You don’t see anything. All you see is a pile of horseshit that Panurge is examining with great interest. What happens when you try to rationalize something, or when you try to find an excuse for what you did or didn’t do? Either you concoct the horseshit yourself, or someone else provides the horseshit for you. Either way, you don’t want people to see what is being covered up. So, your first hint is to get a whiff of that. With underlying assumptions, you first get the smell that something is being hidden. That is the smell of sophistry. Once you recognize that familiar smell, then you know there is something underneath. So, you search what is underneath. In the case of the polygonal-circle, what is the underlying assumption hidden behind it? Sniff it out.

I can see two wrong underlying assumptions. The first wrong assumption is that the straight-line is the only form of measurement in the universe. This is the typical absurd position of Cauchy, Laplace, Newton, Wiener, von Newmann, and Bertrand Russell, who all believed that the calculus was based on such a form of straight-line measurement, which comes from the sense-perception axiom that says: "{***The shortest distance between two points is the straight line***.}"

The second false assumption is an Aristotelian assumption whereby any line, straight or curved, is composed of an infinity of points. So, as a result you have this Aristotelian axiom that says: "{***The shortest distance between two infinitesimally close points is nothing, zero***,} end of discussion. Hence, the sides of an infinitely large polygon must be so small that its number of sides becomes an infinity of points forming the circle itself**.** And there you have it. Bob's you uncle. Flattening out the infinitesimal differential finally solves the problem by throwing the problem away.

However, what is wrong with this last underlying assumption is that points and lines are considered to be sense-perception self-evident things in and of themselves. That is what is wrong with Aristotle, Euclid, Newton, Descartes, Euler, Laplace, Cauchy, and the rest of them. But, how do you get out of that fallacy of composition? You can only get out of this when you stop looking at things as being self-evident things in themselves, and by starting to consider points and lines as mere shadows of multiply connected circular action inside of Plato's Cave.

3. HOW DID CUSA PERFORM AXIOM BUSTING

What is required here is the introduction of a higher principle which can be found at the boundary condition. The point to be made is that a polygon always has an inscribed circle and a circumscribed circle as its internal and external boundary limits. It has a minimum circle which bounds it from the inside, and a maximum circle which bounds it from the outside. {***Thus, any polygon, no matter how many sides it has, must have an inner boundary limit and an outer boundary limit, a minimum and a maximum***.} So, we must do the opposite of what the mathemagician did with his increasing hexagon. And this is what demonstrates that polygons and circles are two absolutely different and incommensurable species.

One is a limited species and the other is a limiting species**.** These are two axiomatically different functions. In the case above, the mathemagician used the wrong species as the limiting species because mathemagicians never work from principles. They work from what seems to be acceptable to popular opinion. So, who cares if we use the polygon or the circle as a boundary condition? To them, it does not matter if the two species are interchangeable; there is no functional difference of principle between them anyway. As a matter of principle, however, that limiting function of the circle cannot exist in the form of a polygon function, because the process of generation is a one-way street. It is circular action that produces the circle and the polygon, not a polygonal action that produces the circle. This is why Cusa says that contradictions can only be resolved in the infinite, or in God's mind.

So, here we have reached a certain degree of humility, man cannot become God and resolve these paradoxes himself. Man has to live with such paradoxes for the rest of his life, and the sooner he is comfortable with them, as opposed to the comfort zone of the circle, the sooner he will begin to make discoveries of principle. This is the beginning of what Cusa called Learned Ignorance**.** We have learned that the polygon cannot become a circle just as man cannot become God. Men do not have access to God's knowledge. However, in our ignorance, we have learned something. We have learned to relate these two incommensurable things proportionality; that is, we have connected the squaring of the circle with the Divine Proportion, such that {***Man is to God as the Polygon is to the Circle***.}

So, we know at least one thing, and that is that we are proportional with God**.** Therefore, we know that we have reached a certain limit of our understanding. So, what is the nature of this limit? What kind of existence does that limit have? What king of existence is it to have to live in the in-betweenness of anomalies and paradoxes? Our situation is always changing because it is neither this nor that. You can say: "I can see that there is a big gap between man and God, but why can't the measure of God be known by the measure of man?" Why is that gap immeasurable? And what do we do with it? What good is it to know that, or to not know it?

I have found that this is extremely useful to know because these are the discontinuities that form the continuum manifold of history. You see, this is where the irony of living in the in-betweenness points to the true state of existence of the creative process of history; because**,** these gaps are like cracks in the wall of the universe through which we can perceive the existence of a universal principle located within it and shaping it from the inside. This is why God is inside of the universe, not outside of it.

So, in our case, for the principle to be perceived, that singularity to exist as a discontinuity. And that discontinuity has to reflect, at the same time, and ellipse and a circle. That is to say, it has to be both itself and something else. Leibniz developed this question in what he called his {***principle of continuity***}, which I have reported on this in a paper I did a few years ago on the {***Vanishing Point***} of Jean Victor Poncelet. For example, Leibniz explained that the last conic section was always the first of the next species. In other words, the limit circle is an ellipse, the limit ellipse is a parabola, and the limit parabola is a hyperbola. So all of the conic sections have the same characteristic discontinuity at their limit boundary. Each extreme case has to be and not be at the same time, itself and a singularity of transition, a discontinuity of change. So, the limit circle is nothing else but an {***elliptical isoperimetric circle***}.

The anomaly, here, does not get resolved. The tension of the perplexity must be maintained even after you have given up this investigation, or you have given up the axiomatic fallacy that there always existed an undisturbed continuity between a polygon and a circle. So, now we begin to look, in awe, towards the future and say: "There is hope. This is where we are {***Getting out of the Bushes into the Future***.}” And, Lyn has already added that this future is the backyard of Kepler, the entire solar system, our new home where we have now all become such singularities as Solarians.

So, the way to give up the axiomatic fallacy of the polygonal-circle is to consider that lines, points, circles, ellipses, parabolas, etc., are mere shadows of a higher principle which projects from the higher domain of {***Sphaerics***}. Then, the isoperimetric principle takes a whole new perspective. So, this is how Cusa dumped these false assumptions of straight line/point measure, when he saw how the anomaly could be understood from the standpoint of a new measure of change. So, in the history of physical science, Cusa became the first modern scientist to destroy the illusion that straight lines and points were the measures of the universe. Cusa, Leonardo, Kepler, Leibniz, Gauss, and Riemann were all anti-Aristotelians and anti-Euclideans, and they all measured the universe by incommensurable discontinuities.

4. THE ELLIPTIC FUNCTION OF ISOPERIMETRIC ACTION

Start with the hypothesis that everything in the universe is generated by multiply connected circular action and consider that concentric circles in the plane are simply shadows resulting from a self-similar conical spiral action projected from within the domain of {***Sphaerics***} or continuous manifold. The power of two expressed by the ratio of 2/1 of the inscribed and circumscribed circles of the equilateral triangle of **Figure 4.** in the plane is the result of the spiral action accomplishing one full revolution around the cone by going halfway up the cone, stereographically, that is, solidly, and expressing it in the discrete manifold.

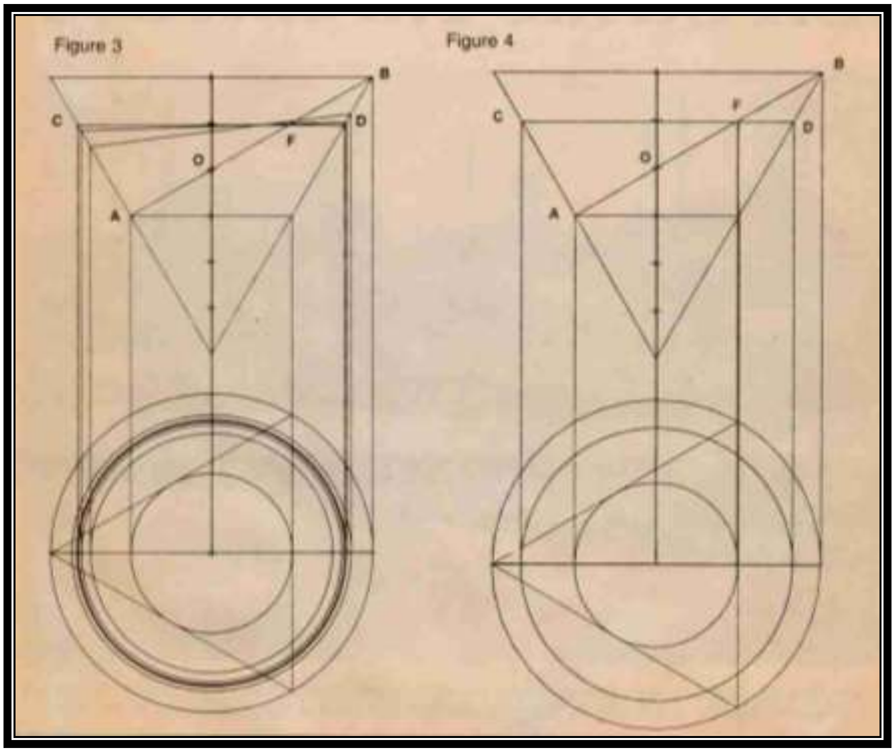

Figure 6. [Cusa's Elliptic function.]

In **Figure 6**, the half way circle A is the minimum, and the base circle B of the cone is the maximum. The ratio remains the same 2/1. Note that the two converging series of inscribed and circumscribed circles in the plane are merely the shadows of conic circles projected from the different elliptical ranges between AB, and C D. By virtue of what Lyn called the principle of {***invariance***}, the projections of the cone are converging toward an impossible elliptical circle CD, which is the paradoxical isoperimetric elliptic/circle located at the ambiguous second focus of the ellipse.

The first focus of all of these ellipses is located on the axis of the cone. Think of this focus as the image of an inverted burning caustic, which mirrors the creative process of God, as reflected in our souls. That is the image you want to convey when you come to a singularity point like the isoperimetric elliptic/circle.

Furthermore, you can observe that the differences in surface area of the isoperimetric polygons in the plane are not determined from the ordering principle of the plane manifold, as it might appear. The reducing margin between the inscribed and circumscribed circles in the plane of the discrete manifold are caused by a rate of the rate of change in the spiral action of the continuous manifold, that is, an increasing proportional decrease in the amount of spiral action in the cone. It is such an infinitesimal unit of action in the continuous manifold that represents the measuring unit of change in the universe. With respect to the plane, this second-degree rate of action in the cone reflects the action of a higher geometry of {***Sphaerics***}, which is outside and is superior in complexity to the domain of the plane. At a certain point, in the next few weeks we will study more closely how Lyn describes this axiomatic change as an economic process in {***So, You Wish to Lear All About Economics?***} I will send you an e-mail of Chapter III on {***Thermodynamics of Political Economy***}.

{***The amount of least action work produced by the spiral action is measured by the rate of change between the minor and major axis of the elliptic function*}*,** which is acting as a hypergeometric {***quadratic mean***} between different ellipses akin to the singularity of the Archytas {***quadratic point***} in his model of doubling the cube. Think of this iterative process as a {***quadratic function of functions***}. Thus, the Cusa idea of the isoperimetric process can be represented by a series of well-ordered ellipses that is dependent upon a higher principle acting on it from the outside. By replacing the polygons by ellipses, which converge in a proportional fashion toward a limit singularity, you can see the nature of the axiom busting method that Cusa is thinking about with his Isoperimetric Principle.

By replacing the false assumptions of the reductionist Aristotelian-Cauchy lines and points for measuring curvature by the {***stereo-form***} of an isoperimetric continuous manifold, Cusa opened the door to modern science leading directly to Kepler's discovery of the principle of gravitation, and leading him to call for the study of a calculus for the determination of an elliptical geometry that was later developed as the least action principle of the calculus by Leibniz. Gauss later followed this same pathway in his examination of asteroids using his arithmetic-geometric mean function.

Lastly, I would like you to reflect briefly on Leonardo da Vinci's treatment of the Cusa Isoperimetric Principle. I am referring specifically to Leonardo's Isoperimetric Man.

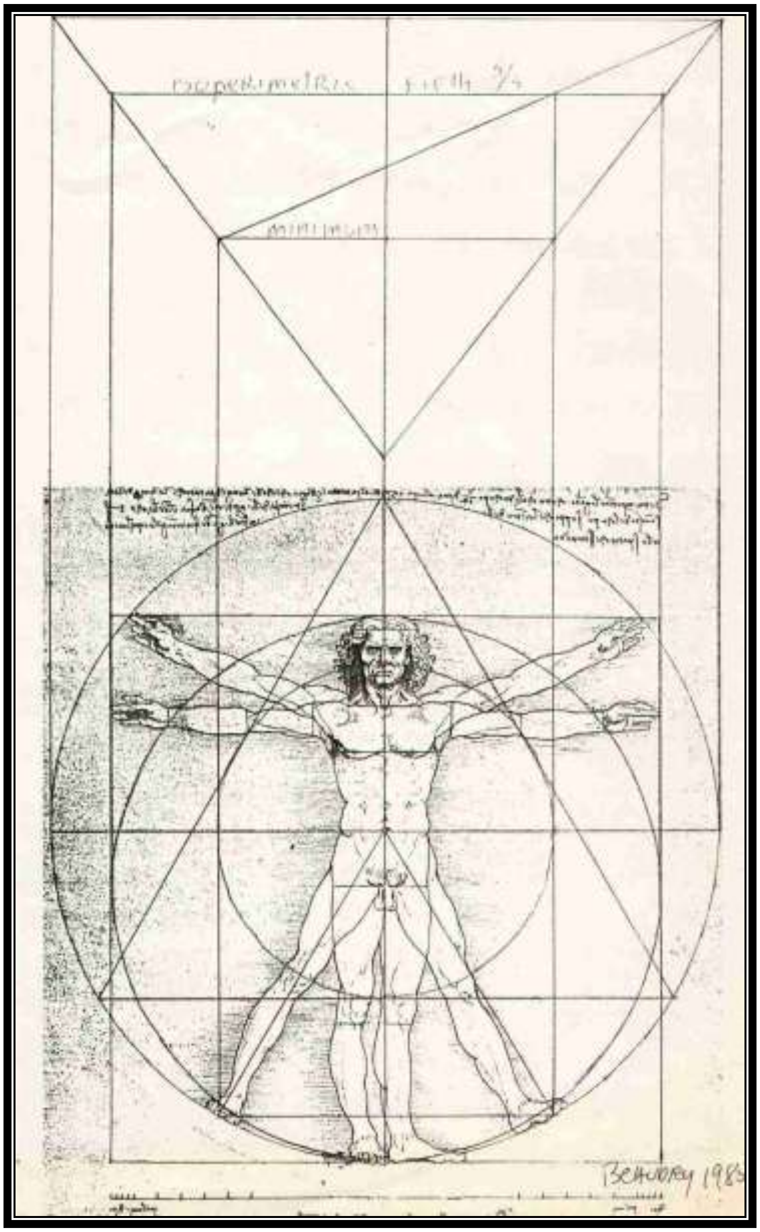

Figure 7. [Leonardo's Isoperimetric Man.]

Leonardo's man, which is generally referred to as his treatment of the golden section is a direct reflection of the Cusa idea of squaring the circle. In fact, **Figure 5** represents Leonardo's conceptual representation of Nicholas of Cusa's Isoperimetric Principle. You can see that the underlying conic projection from the continuous manifold, projecting the image of the square in the discrete manifold, is a geometrical representation of man generated from the same isoperimetric elliptical/circle developed by Cusa in his paradox of squaring the circle. From that vantage point, it were better to identify Leonardo's drawing as {***Leonardo's Isoperimetric Man***} because this man's ambiguous stance straddling both the circle and the square is the representation of the ambiguous position that man has to take with respect to truth; that is, with respect to the relationship between the polygon and the circle, or between man and God. Now, let's look briefly at how an elliptic function treatment of the same isoperimetric principle would look like when you use an arithmetic-geometric progression.

5. THE SINGULARITY OF THE ARITHMETIC GEOMETRIC MEAN AND THE IRONY OF THE PYTHAGOREAN COMMA

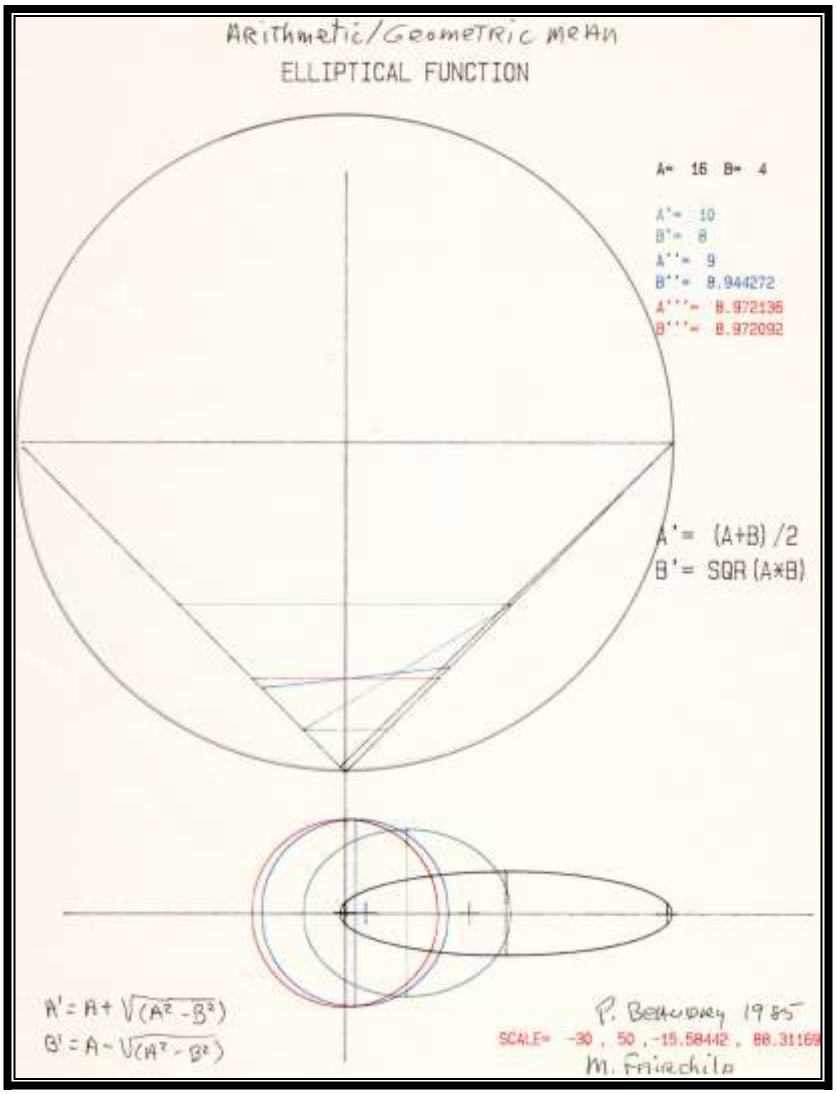

Figure 8. [**An Arithmetic-Geometric Mean Elliptic Function.]**

This **Figure 8** shows an elementary elliptic function that Marc Fairchild and I constructed when we worked together in Chicago, back in 1985, and which we estimated had to correspond to what Gauss meant by an arithmetic/geometric mean function. We did not know what Gauss was doing specifically, but we estimated that what he was doing had to correspond to Lyn's idea of invariance between a continuous manifold and a discrete manifold. So, we didn't use any sophisticated mathematical knowledge to move in that direction. We simply used the minimum-maximum relationship between arithmetic mean and geometric mean and applied it to a conic function.

Instead of using the traditional conical application of the arithmetic and geometric means, we simply transposed the functions of those means to the changing values of the major and minor axis of an ellipse. So, the major axis of the ellipse became represented by the classical value of A plus B over two, and the minor axis of the same ellipse became represented by the classical value of the square root of A times B. Every iteration yielded a different ellipse and, within no less that four steps, we realized that we could transform a very elongated ellipse into a quasi-circle; and conversely, we could transform an ellipse into a quasi-straight line. This was confirming what Cusa had been saying in his {***Learned Ignorance***}. So Marc and I produced several cases, which generated some very interesting results. One of the most interesting ones was when we found the equation for the inversion of the process.

Neither of us were mathematicians, but since Marc was skilled in computer programming and I had been born with a compass in my head, we decided to put our two heads together and got the result that you see in **Figure 8.** What I found interesting about this construction was that it represented a higher-order invariance, a higher-order transformation that was reflected in the discrete manifold as a second derivative rate of the rate of change.

To my mind, this reflected a continuation of the Isoperimetric Principle of Cusa. And, Cusa's principle had become the necessary hereditary predecessor to the arithmetic-geometric mean of Gauss. The iteration process of the elliptic function worked like the Cusa iteration for the isoperimetric elliptic/circle. The values were not the same but the conceptual process was the same.

Furthermore, this discovery of an arithmetic-geometric elliptic function reflected the singularity producing process that Lyn had been using as the metaphor for the Bel Canto voice register shift, as well as for the register shift of the Solar system that Kepler had identified as the location of an exploded planet in the general region of the asteroid belt. So, even back then, we were dealing with some very interesting axiom busting material, but we didn't know what it was exactly that we were busting, back then, except that our focus definitely was no longer fixed on things in themselves, like points and lines, but rather on the {***inbetweenness of intervals of action***}.

It was only recently, after Lyn had begun to intervene with the LYM that I began to realize that this reflected the existence of a universal physical principle which was underlying both the scientific domain, the Classical plastic art domain, and the musical domain, that is, what Lyn was saying about the Pythagorean comma, and the significance of its anomaly, which began to come together as an expression of tempering within an astrophysical-economic orbital cycle.

Now, this gave me another proof that real wealth was in our minds and not in our pockets. You see, according to the reductionists, the Pythagorean comma was worth just 24 cents! This is the price you have to pay for the fact that it is impossible to establish a perfect cycle of fifths, with whole numbers. However, what you got in exchange for it, as Lyn pointed out, was a glance at the process of creativity. So, a glance through that 24 cents sophistry is worth much more. The Pythagorean comma reflected an anomaly of the creative process, both from the standpoint of the well-tempered system of Bel Canto and for the well-tempered solar system that we live in. Indeed, if one were to define the cycle of the well-tempered system by generating perfect fifths with whole numbers, that is, with the ratio of 3/2, and try to impose that curvature on the series of the twelve intervals of the musical octave

Eb Bb F C G D A E B F# C# G#,

the interval between **Eb** and **G#** would be the location of a Pythagorean comma, and the octave would be so dissonant that it could not return to its cyclical starting point an octave higher or lower. This is where the Cartesians start fudging like crazy.

The point is that, the well-tempered system cannot function with rational whole numbers. If you tried to make it work by fudging, it would be like wrenching the elliptical pathway of a planet in our solar system to make it fit a perfect ellipse. That would be sophistry, a fallacy of composition. The elliptical pathway of a planetary course does not close on itself either, because it is an elliptical-spiral action within another larger elliptical-spiral action! And, as Lyn pointed out, it is the universal principle of gravitation that defines the pathway of the ellipse, not the ellipse that defines the pathway of the planet. Therefore, what is required is to temper the musical and solar systems with the appropriate dynamic principle of infinitesimal logarithms congruent with the Kepler principle of gravitation, and with the Leibniz calculus. Otherwise, if you were to start generating a series of perfect fifths, the cycle of fifths would exceed the octave series by a silly amount of 24 cents. Let me illustrate this with the following pedagogical sophistry that a typical Cartesian music historian, Phil Sloffer, put out on line at

www.music.indiana.edu/som/piano_repair/temperaments/**pythagorean_comma**.html

Say the perfect fifth is worth 702 cents, and the price of an octave is 1200 cents. When you add the following two series, you can easily see what the difference is.

If the fifth is worth 702 cents, the series of perfect fifths is

702+702+702+702+702+702+702+702+702+702+702+702 = 8424.

If the octave is worth 1200 cents, the series of perfect octaves is

1200+1200+1200+1200+1200+1200+1200 = 8400.

Then, 8424 – 8400 = 24 cents, that is the difference that he allotted for the Pythagorean comma. That is not worth much, but what you can discover through this mechanistic platitude is a lot, because it represents a crucial anomaly pointing to the difference between the creative process and the Cartesian mechanistic view of the world.

Here, David Shavin demonstrated for me how these so-called musicologists indulge into the most incompetent manipulation of the well-tempered system by flattening out the comma with their measurements in "cents". David showed that if you wished to approximate the physical process of the Pythagorean comma, the closest approximation was to use the difference between 3/2 to the 12^{th} power and 2 to the 7^{th} power. However, this would still be an approximation. Mathematics cannot replicate the actual physical process!

Furthermore, Lyn has also recently made a very important corrective point about such treatment of the comma by arithmetic approximation when he said: "{***So, when you overlay two voice lines, at different divisions of the octave, you generate, in trying to extend those intervals, you come to something which is a little different in terms of division of the octave: this difference is called the comma. Now, you can do it with thirds – a third is a simple one – but you actually get into what Gauss defines as the arithmetic-geometric mean***.}" (Monday Morning Briefing, August 14, 2006.) This is the dynamic that I will discuss below with the Lydian minor-third shock effects that Leonardo used in his treatment of {***The Last Supper***}, as exemplary of a real Bel Canto living process.

From the standpoint of Classical Bel Canto polyphony, what you can see, here, with your mind's eye, is that the principle behind this Pythagorean comma is the same as the principle behind the precession of the equinoxes, which keeps the elliptical pathway of the planet open during the entire process of the yearly cycle; and that is a reflection of the principle of creativity that acts everywhere universally in the infinitesimally small, and which makes the whole difference between man and animal. The point to make clear, here, is that it is the principle of gravitation underlying the comma that produces the 256 series of whole numbers and not the 256 series that produces the comma. As LaRouche keeps pointing out, this shows what Pythagoras and Plato expressed by the Greek term {***dynamis***}, and what Leibniz properly defined as "dynamics" in his polemics against the mechanistic Cartesians. This is why a calculus of well-tempered logarithms is required to solve this type of anomaly. I will show you how to construct one, geometrically, at some future time.

FIN (8/19/2006.)

ADDENDUM FOR THE ARCHYTAS MODEL: CONSTRUCTING THE THOUGHT-OBJECT FOR THE TORUS-CYLINDER CURVE.

Hi Pierre! Manilla, 8/17/06

Got all the images you've sent. Thanks! See you Saturday. By the way, how to trace the torus-cylinder curve on the cylinder model with the 9cm height--the easy way? I know that it's the projection of the torus on the cylinder as it pivots around the axis A.

--Ver

Hi Ver and everybody, Leesburg Va. 8/17/06

There is no such a thing as an easy way to trace a curve. There is only a rigorous step-by-step proof by construction, which you must think through and discuss with others in the class. The objective is to develop a thought-object first in your mind. And remember, you are not simply constructing a curve, you are constructing a solid thought-object process which is tracing a double curve relative to the creative process. So, the best way to proceed with this is to discuss a method of construction with the group, and then, send me your results.

So, in the case of the Torus-Cylinder curve, you must first imagine the process of a moving point along the circumference of the Torus half-circle. Let's call that point: potential "P". That process is the key. Once you see that imaginary point moving along the continuous curvature of this half-circumference, from C to A, while you rotate the pivoting torus half-circle at right angle against half of the Cylinder base circumference, then a solid thought-object, a {***stereo-idea***}, is beginning to form in your head, as this imaginary point moves along. That solid though-object is the dynamic process of change which traces the Torus-Cylinder curve! That's the important thing to discover: the process of change, not the curve itself.

However, you don't know where this potential point "P" is going to stop, so the shadow of its motion must be traced around the full half-circumference of the Cylinder corresponding to the full half-circle of the Torus. It is only the conic function, intersecting this process, that will decide where point P is to be located.

So, you have to imagine that, as you are rotating the Torus half-circle around point A, that Torus-Cylinder curve is also being traced by the imaginary point moving up along that half circumference of the Torus half-circle, from C to A. Study closely the three figures (tracers) that I sent you, and which show three different positions of that animation of tracing potential point "P". Then, once that part of the solid thought-object is formed, you will realize that if you trace a perpendicular line from any one of those potential points along that circumference, and trace it down from the Torus half-circle to the base of the cylinder circle, that straight line has to coincide with the wall of the cylinder, in all positions, because that line is where the wall of the Cylinder and the body of the Torus intersect. Then, the process of your solid thought-object is completed as you rotate that imaginary vertical straight line, one end of which is tracing the half-circle of the Cylinder base, and the other end is tracing the Torus-Cylinder curve.

So, once you see that entire {***stereo-idea process***} in your mind, it is easy to choose about four such vertical lines, or more, along the circumference of that Torus half-circle, and transpose their heights onto the chosen positions along the wall of your Cylinder and trace the curve, free-hand, between all of the summit-points. That is the solid thought-object you have to construct in order to generate the Torus-Cylinder curve. You must find a similar method for the construction of the Cone-Cylinder curve.

So you see, this has to be discussed with the other members of the group, and you should come up with the most effective means of generating that solid thought-object process. This is what the ancients called the proof of existence by construction. It is essential that such a proof by construction be done socially, not individually, because this is the way that you can best communicate your individual creative insights among each other.

See you Saturday.

Salut.

Pierre.

FIN