THE TIME FOR AXIOMATIC SHOCKWAVES IS NOW!

Why Classical Artistic Composition must replace mathematics in physics

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INTRODUCTION

> "To signal Freedom, fire the cannons of scientific sophistry." Lyndon LaRouche, *EIR*, August 4, 2006, p. 23.

> "The greatest danger represented by the coronavirus is that it could mutate; but the greatest hope that such a danger inspires is that of a mutation in our own way of thinking and acting…. because the coronavirus reveals how the global monetary regime is the explosive which threatens all of us." Jacques Cheminade, *Nouvelle Solidarite,* March 13, 2020.

The greatest danger to humanity is for the biosphere to destroy the noosphere. This means that the noosphere must fight back to give the biosphere a higher purpose by adding to it a higher dimensionality of action. If you wish to prevent the biosphere from collapsing, bring into the noosphere the higher form of geometry that Lyndon LaRouche was promoting, because the mathematics of globalization no longer works; it is essential to replace the failed mathematics by classical artistic composition. The present report is on the subject of a new *epistemological geometrical model*, which must include classical artistic composition as a metaphorical means of its measurement of that model. Lyndon LaRouche used two axiomatically different types of geometry to accomplish such an important mission, and he laid stress on the need to perform the action as opposed to observing or listening to it. For that unique purpose, he used the following heuristic example.

Lyn posed the following puzzling question: what led Kepler to hypothesize the existence of an exploded planet in our Solar System which is located in the orbiting field located between Mars and Jupiter? Over years, LaRouche answered that question in many different ways, but in my opinion, the best answer he gave among all was the following:

"The proof that the universe contains efficient universal principles which are not themselves directly objects of the senses, presents us with the need to think of the individual's relationship to nature around us in terms of two geometries. The first of those is what I have defined, in the preceding pages, as the anti-Euclidean form of the geometry of the universal Sensorium; the second is a geometry based on nothing but an experimental reading of the measurable relations within a set of inter-relationships among those discoverable, and experimentally validated universal physical principles, which are generated by Plato's method of hypothesis. The first is approximately the shadow-world geometry of sense perceptual space-time. The second is the unperceived universe of those actual principles which produce those paradoxical sensory effects which prompt the recognition of the existence of the unperceived, but efficiently existing universal physical principles. The two geometries are everywhere interacting." [1]

LaRouche's distinction and the coincidence between two such opposite but complementary geometries provides us with an axiomatic explanation for the existence of axiomatic singularities in both the physical and mental domains, in science as in artistic composition. That is what Kepler and Gauss identified in their

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[1] Lyndon H. LaRouche, Jr., _Science for Teachers: Visualizing the Complex Domain_, EIR, Vol. 30, No. 27, July 11, 2003, p. 27. Another publication by LaRouche on this same subject can be found in, Lyndon LaRouche, _Cold Fusion: Challenge to U.S. Science Policy_, Schiller Institute, August 1992. Lyn Wrote: "In the experience represented by the Gaussian complex domain, we combine the notion of the sensed object with the notion of the effect on its motion generated by the unsensed, but efficiently manifested principle. One component is, on principle, a view of the relevant phenomenon within the domain of a spherical universal space-time of sense-experience. The other component is the unseen, but actual universal physical principles acting upon the object of perception. The modern typification of this relationship is the argument underlying Cusa follower Kepler's uniquely original discovery of a principle of universal gravitation, a discovery which marks the modern transformation of mere astronomy into a subject of astrophysics. After that, no longer can motion within the observed universe be attributed to the repeatable regularity of motion, as by the modern defenders of the hoaxster Claudius Ptolemy, but must be traced to the power exerted by an unseen, but efficient and knowable universal physical principle. When we trace the intellectual history of the idea of the complex domain from the practice of Sphaerics by the Pythagoreans and Plato, we proceed in mathematical constructions through the anti-Euclidean, geometrical doubling of the square, to Archytas' geometrical doubling of the cube." Lyndon H. LaRouche, Jr., _On the Noetic Principle: Vernadsky and Dirichlet's Principle_, EIR, Vol. 32, No. 22, June 3, 2005, pp. 41-42.

respective discoveries of the arithmetic/geometric Lydian singularity of the solar system. This means that the best way to apply such a higher form of quadratic principle is to replace mathematics with something that causes change.

"The study of the implications of Kepler's principal discoveries, and their reflections in the work of those who followed Kepler, is the best historically-grounded approach to prompting the student's ability to locate science in discovery of the experimental form of expression of universal physical principles per se, thus freeing the student from the dumbing-down effects of today's common ontological malpractice, of substituting a description of a mathematical formulation, which merely approximates a shadow of the relevant idea of principle, as if it were a proper substitute for knowledge of the principle itself.

"The object is to free the mind from the stupefaction which the satanic Olympian Zeus demanded be imposed upon a mankind degraded to the limits of intellect prescribed for an oligarchical Satan's human cattle. Let the lowing of the cattle on the campuses be transformed into the delightful sounds of bright souls lifted in enjoyment of choral beauty."[2]

In practice, this means scrapping the Council on Cultural Freedom's view of artistic composition and scrapping mathematics in science more generally, in order to restore the role of classical artistic composition to its rightful place. LaRouche confirmed Kepler's discovery as follows:

"The task of the playwright or composer is to foresee the arrangement of the shadows represented by the seen and heard action on stage, and to arrange those shadowy elements deployed in such an ironical fashion as to provoke the audience to search its own mind for the reality to which those shadows correspond. It is as if God [had] arranged the visible motion of the Solar System to cause Kepler's mind to recognize the reality of a universal principle of gravitation. So, the adequate performer of a Classical musical composition crafts his or her performance to force the real intent of the

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[2] Lyndon H. LaRouche, Jr., *Why the Senate's Intelligence Has Failed: Reanimating an Actual Economy*, EIR, Vol. 33, No. 31, August 4, 2006, p. 23.

composer upon the audience. The greatest conductor of the Twentieth Century, Wilhelm Furtwangler, referred to this as "performing between the notes.""[3] [add Shakespeare]

The point to be made, here, is that Kepler's discovery is at the center of Lyndon LaRouche's fundamental discovery of principle of *Potential Relative Population-Density*. And, the surprising irony is that the singularity of the Lydian orbital value located at the arithmetic/geometric mean mid-section of the solar system's triply-connected rotating action is where Kepler hypothesized the locus of a non-existing planet. The question is: How could something that is seemingly not there lead you to discover a universal principle of harmony in the universe? This is quite perplexing, at the very least. As Lyn identified:

> "This insight led to Kepler's defining a set of orbital values characteristic of a necessary exploded planet, lying in a designated orbit between Mars and Jupiter; an exploded planet which Gauss proved, nearly two centuries later, to be the remains known as the Asteroid belt."[4]

The beauty of Kepler's discovery is that the locus of transformation of this Solar System singularity is the same as the locus of the voice register shift in the well-tempered musical system. Thus, as LaRouche recognized, it is as if God had created the solar system for the purpose of having human minds discover the significance of an axiomatic change through the experimentation of a change of manifold. This singularity alone proves that the Solar System is alive as the human voice, which, itself, is alive as the human mind. Why would God want the human mind to sing in tune with the Solar System? What is the geometrical nature of this epistemological challenge?

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[3] Lyndon LaRouche, Op. Cit., p. 28.
[4] Lyndon H. LaRouche, Jr., Science for Teachers: Visualizing the Complex Domain, p. 27

THE PLANETARY ORBITS AND THE EQUAL-TEMPERED MUSICAL SYSTEM
by WILLIAM BOHDAN

PLANETS	ASTRO. UNITS	Log. 10X	ADDED CONSTANT	MULTIPLE CONSTANT	CYCLE EQUIVALENT	MUSICAL CYCLES	PLANETS
MERCURY	(P) 0.310	0.5086	+2.496	x 128.8	255.97	C = 256	MERCURY
MERCURY	(A) 0.470	0.3279	" "	" "	279.25	C#=271.22	MERCURY
VENUS	(P) 0.715	0.1457	" "	" "	302.72	D = 287.35	VENUS
VENUS	(A) 0.725	0.1397	" "	" "	303.49	Eb =304.44	VENUS
EARTH	(P) 0.983	0.0074	" "	" "	320.52		EARTH
EARTH	(A) 1.017	0.0073	" "	" "	322.42	E = 322.54	EARTH
MARS	(P) 1.379	0.1396	" "	" "	339.46	F = 341.72	MARS
MARS	(A) 1.661	0.2204	" "	" "	349.86		MARS
ASTEROIDS	(P) 2.2	0.3424	" "	" "	363.32	F#=362.04	ASTEROIDS
ASTEROIDS	(A)3.6	0.5563	" "	" "	393.13	G = 383.57	ASTEROIDS
JUPITER	(P) 4.95	0.6946	" "	" "	410.95	Ab=406.37	JUPITER
JUPITER	(A) 5.45	0.7364	" "	" "	416.33		JUPITER
SATURN	(P) 9.006	0.9545	" "	" "	444.43	A = 430.54	SATURN
SATURN	(A)10.074	1.0032	" "	" "	450.69	Bb=456.14	SATURN
URANUS	(P) 18.288	1.2622	" "	" "	484.05	B = 483.26	URANUS
URANUS	(A) 20.092	1.3030	" "	" "	489.31		URANUS
NEPTUNE	(P) 29.799	1.4742	" "	" "	511.36		NEPTUNE
NEPTUNE	(A)30.341	1.4820	" "	" "	512.37	C = 512	NEPTUNE

Note how the Asteroid Belt is located at the arithmetic/geometric mean between Mercury and Neptune; separating axiomatically four planetary orbits within a Lydian modality on each side of the Asteroid Belt.

The irony, here, is that Kepler's process of complex motion is what led him to discover an axiomatic difference between the formation of the planets on the two opposite sides of the asteroid belt. A similar question arises with the emergence of the current coronavirus (Covid-19). How can a liberal monetary system be the same, before and after this pandemic endangering humanity as a whole? It cannot and it will not. The only chance humanity has to pass the Lydian test of the present axiomatic change that the coronavirus has triggered will be to adopt, foremost, LaRouche's Four Legislative Principles among Russia, China, India and the United States. Other nations can join in later.

HOW LYNDON LAROUCHE UNDERSTANDS ECONOMICS

"And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth." Genesis I:28

Lyndon LaRouche called his fundamental principle of economics: "*Potential Relative Population-Density.*" He appears to have given a first rigorous definition of this new concept in an article titled, *Economics and Population*, published in the *Campaigner Magazine* of October 1980. He later presented his concept at the International Symposium on Economics of the Monterrey Institute of Technology and Advanced Studies (ITESM) from March 9-13, 1981, in Monterrey, Mexico. LaRouche stated his original discovery of principle in the following simple but rigorously axiomatic manner:

"I now direct your attention to the axiomatic features of the problem of technology generally. With an eye to the necessary interconnection between petroleum and nuclear-energy development at this juncture of world history, I summarize the necessary proofs for a conception best labeled *potential relative population-density*. This conception, I shall demonstrate, is the sole premise of economic science.

"I shall now argue that this notion of potential relative population-density is the fundamental metric to be employed for determination of the value of terms of mathematical functions describing economic processes, a value which can be rigorously determined without regard to any existing market-determination of prices. I shall demonstrate how economics, defined in this way, directly intersects and enriches the specialty known as thermodynamics. It is in that connection that the unique appropriateness of Riemannian physics for economic analysis is situated. I shall limit myself by regard for the fact that most of you are not physicists. This will be no impossible difficulty, since the essential points can be demonstrated efficiently to any group of persons familiar with the problems of technology

from the vantage point of economics studies. "I shall be profound, but I believe I shall also succeed in being simple."[5]

After describing the nature of the physical power under which a potential relative population-density is capable of sustaining itself per square kilometers, following alterable conditions, LaRouche confronts us with the conditions under which that population can be made to increase and improve its general welfare. This is not based on biological conditions, but rather on cultural and scientific advancement of society as a whole; that is, through the improvement of cultural and technological progress under which humanity can be pulled forward together into the future as a species. As LaRouche said: "The more powerful the individual becomes as culture advances, the greater the relative cost of producing each individual of that power. In general, the more advanced the technology, the greater the cost of producing an individual adapted to employ that technology."[6] Therefore the question arises: how can you increase potential relative population-density? This is where the Kepler/Gauss Lydian singularity comes in. The increase in potential relative population-density requires human society as a whole to make axiomatic changes in knowledge and in application of new technologies. Fusion power, for example, is the required next step for mankind to take in order to acquire the free energy necessary for exploring the nearby space of our Solar System. As LaRouche stated:

> "My proposal to begin the 'Earth forming' of the Saturn Moon known as Titan beginning the geophysical year 2057 A.D. is an imminently realistic proposition. We shall have major stations orbiting near Earth. We shall move in ferries to and from these stations and the surface of our planet. Immense fusion-powered spaceships, accelerating to tremendous velocities, will be capable of carrying stations to nearby planets and their moons. By

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[5] *Lyndon H. LaRouche Jr., *Economics and Population*, The Campaigner, Vol. 13 No. 8, October 1980, p. 7. This 17-page paper was prepared for the International Symposium on Economics of the Monterrey Institute of Technology and Advanced Studies (ITESM), March 9-13, 1981, Monterrey, Mexico. Axiomatics of Economics.

[6] *Lyndon H. LaRouche Jr., *Economics and Population*,, p. 8.

the end of the next century, human exploring parties should have visited the vicinity of some nearby star."[7]

In order to accomplish that mission, one must give up the usual idea that energy can be measured by scalar units of counting calories, watts, or dollars. Instead, what Lyn proposed is an epistemological form of triply-connected measurement using torus least action. However, look at the torus geometry as a metaphorical process of transformation rather that of a one on one mapping and curve fitting process; thus, apply it to the considerations that LaRouche made with respect to a classical humanist mode of education.
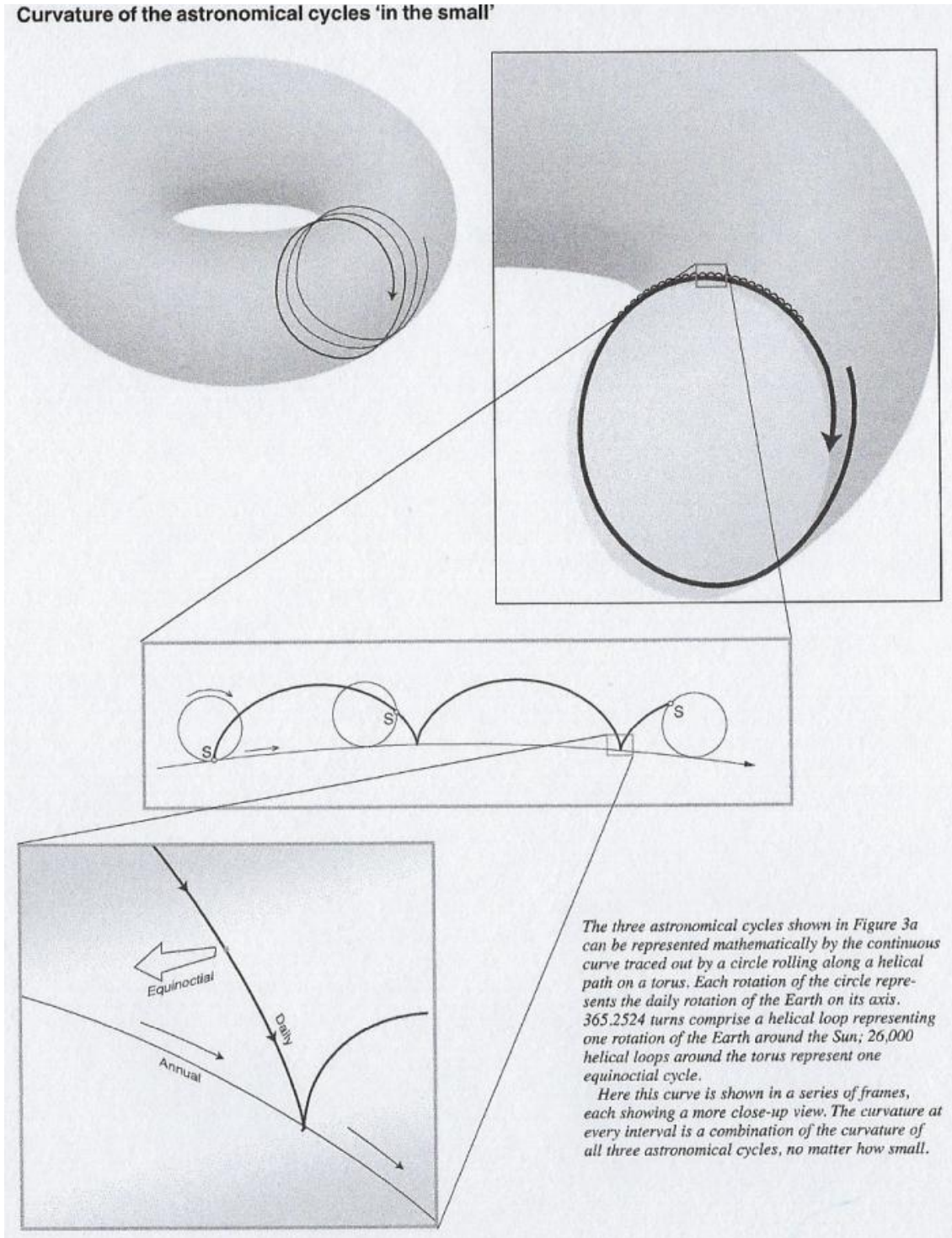
ROBERVAL'S CONSTRUCTION OF THE CYCLOID

As far as I know, beyond simple circular action, there are at least four other simultaneously interactive forms of triply-connected circular actions in the physical universe as a whole; they are: Helical, Toroidal, Spiral, and Spherical. My hypothesis, is that what links them all together is the cycloidal action as constructed by Gilles Personne de Roberval and which LaRouche used as the geometrical means best suited to encompass the complex triply-connected circular action of the Earth within the galactic system. Lyn described his choice of illustration as follows:

> "The three astronomical cycles shown in Figure 3a can be represented mathematically by the continuous curve traced out by a circle rolling along a helical path on a torus. Each rotation of the circle represents the daily rotation of the Earth on its axis. 365.2524 turns comprise a helical loop representing one rotation of the Earth around the Sun; 26,000 helical loops around the torus represent one equinoctial cycle. Here this curve is shown in a series of frames, each showing a more close-up view. The curvature at every interval is a combination of the curvature of all three astronomical cycles, no matter how small."[8]

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[7] *Lyndon H. LaRouche Jr., *Economics and Population*, p. 9.
[8] The galactic torus cycle from Lyndon H. LaRouche, Jr., *Truthful, or Merely 'Factual'?* EIR, Vol. 25, No. 2, January 9, 1998, p. 36.

Curvature of the astronomical cycles 'in the small'

The three astronomical cycles shown in Figure 3a can be represented mathematically by the continuous curve traced out by a circle rolling along a helical path on a torus. Each rotation of the circle represents the daily rotation of the Earth on its axis. 365.2524 turns comprise a helical loop representing one rotation of the Earth around the Sun; 26,000 helical loops around the torus represent one equinoctial cycle.

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Lyndon H. LaRouche, Jr., *Truthful, or Merely 'Factual'?* EIR, Vol. 25, No. 2, January 9, 1998, p. 36.

THE ROBERVAL CYCLOID
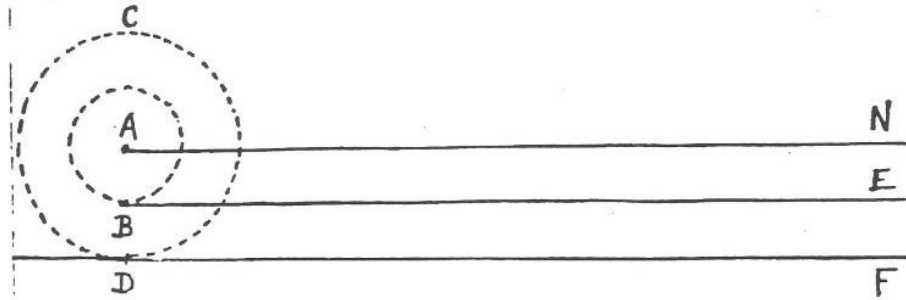
FIGURE 1

FIGURE 2
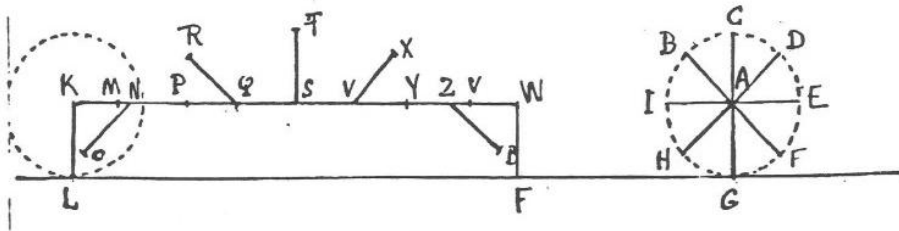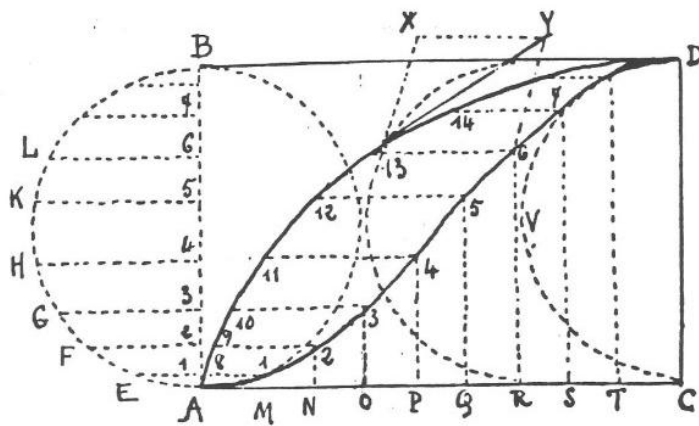

FIGURE 3

The three steps of the Roberval cycloid. https://www.youtube.com/watch?v=Hg1M5h6Rk38

The fascinating geometrical aspect of Lyn's astronomical cycles is that there are different but continuous quadratures of circular action at the different levels of

the construction which do not require any form of mathematics, and yet they require complete quadrature. The simplest example of quadratures that I have chosen to demonstrate this requirement, comes from the construction of the Roberval cycloid as Lyn recommended we investigate.[9] Imagine the following example of a least action formation of a cycloidal surface of negative curvature being generated inside of the LaRouche galactic torus!
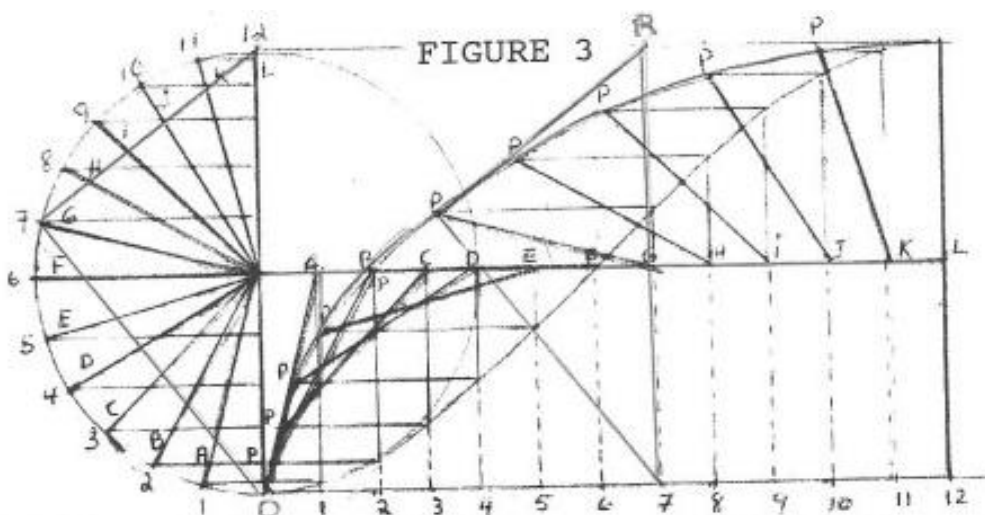
Roberval cycloid construction

Note that the Roberval cycloid motion is transporting the area of the half-circle (radii and horizontal "indivisibles") into the area under the cycloid curve, thus generating a new sweeping area which establishes the quadrature of the cycloid using infinitesimals without the using mathematics.[10] The beauty is that

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[9] Lyndon LaRouche, _Cold Fusion: Challenge to U.S. Science Policy_, Schiller Institute, August 1992, pp. 45. "For the initial classroom exposure of the secondary pupils to the cycloid, we follow the model of Roberval and Huygens. Roll a circle along a straight line. Mark the point of the circle's tangency to the line at the start. Plot the continuous trajectory of that point as the circle rolls, up to the moment that point is next once again tangent to the same straight line. This trajectory is the simple cycloid. Construct next, after Roberval, the sine wave which Roberval names 'the companion of the cycloid.'' The pupil should work through all of the Blackwell English edition of Huygens' _The Pendulum Clock_. Also: Gilles de Roberval, '_The Cycloid_,' from Treatise on Indivisibles, trans. by Evelyn Walker, (New York: Teachers College, 1932)."

[10] This sweeping and spreading motion reminds us of Kepler's description of the solar system as being analogous to the creative thinking process of the human mind: "…that the disposition of the local revolutions of the individual planets round the Sun towards the Sun's 'immutable' gyration in the central space of the whole system is the same as the disposition of the 'thinkable' to the 'understandable,' of the manifold processes of reasoning towards the completely simple understanding of the mind. For as the Sun in its revolution about its own axis moves all the

you don't need any mathematics to accomplish such a sweep. But, what you see are the invisible infinitesimals of Leibniz, which Roberval carries, one by one so to speak, from the half-circle to form the quadrature of the half-cycloid. As a result, the same area of the half-circle is found in a different shape under the cycloid curve; that is, an area perfectly enclosed by a cycloidal curve at one end and by a sine curve at the other end. Thus, paradoxically, for the first time in history, Roberval's discovery enabled people to see and touch Leibnizian infinitesimals.

Thus, the area under the entire cycloid curve is three times the area of the generating circle. Such a paradigmatic change involves the following three essential axiom busting steps.

1) First, it is the surface change which resolves the paradox of the different rotating circles. How can two different concentric circles, such as generated by radius **AB** and radius **AC** (Figure 1), rotate along the same distance, causing their different rotating actions to be equal, such that **AN** = **BE** = **DF**!? That paradoxical situation must cause a most necessary moment of perplexity.

2) Secondly, the Roberval cycloid (Figure 2) represents the motion of a radius generating a new surface which is invisible and yet covers the entire area between the cycloid line and its companion line, the sine wave. This is an axiomatic transformation between a line and a surface. In other words, the idea of the cycloid is the idea of a surface instead of that of a curved line, as if the rotation of the radius were the rotation of a painter's brush covering a surface along the length of each radius length, **KL, NO, PM, QR, ST, VX, YV**, etc. What happens with this change in manifold is that you are rotating an infinite number of circles whose circumferences are all of different sizes, yet their rotations cover the entirety of a new surface under the curve, which is equivalent to a half-circle. By understanding the cycloid as a surface, you are able to resolve the paradox of the

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planets by the emanation which it sends out from itself, so also the mind, as the philosophers tell us, understanding itself and all that is in itself, stimulates the use of reason, and by spreading and unfolding its simplicity, causes all things to be understood. And so closely are the motions of the planets round the Sun and the processes of reasoning linked and tied to each other that if the Earth, our home, did not measure out its annual circuit in the midst of the other spheres, changing place for place, position for position, human reasoning would never struggle to the absolutely true distances of the planets, and to the other things which depend on them, and would never establish astronomy." p. 496. Johannes Kepler, The Harmony of the World, Translated by E.J. Aiton, A.M. Duncan, and J.V. Field, The American Philosophical Society, Philadelphia, 1997, p. 496.

different circles traveling the same distance. However, this discovery cannot be made at the dimensional level of the line. That is a first shockwave effect.

3) The surface area under the cycloid curve (Figure 3) is generated physically and not mathematically by the rotating transport of the rolling horizontal lines (indivisibles) of the half-circle. This second shockwave effect comes when you realize that the new surface area of the half-circle is bounded by the cycloid curve and by its companion, the sine curve, and therefore, each "indivisible" included in that new area reflects the triply-connected motion of the LaRouche galactic torus; that is to say: *first is the down to up motion (daily); second is the left to right motion (annual); and third is the back to front motion (equinoxial).* Thus, the characteristic nature of the Roberval cycloid is that is triply-connected; that is to say that it is the only natural construction which reflects the three galactic directions of motion that Lyndon LaRouche referenced in his galactic torus: the up and down motion of 24 hours (Daily), the left to right motion of 365 days (Yearly-Poloidal), and the back and forth motion of 26,000 years (Equinoxial-Toroidal).

The crucial connection, here, and the third and greatest shockwave effect, is to relate this construction to the scientific-artistic design of Leonardo da Vinci; that is, by applying the epistemological geometry of the caustic of light and shadow (*sfumato*) to artistic composition for the purpose of causing a change in human emotions; that is to say, by activating, simultaneously, the triply-connected interaction of the non-living, the living, and the noetic domains of human behavior. This is where artistic composition comes in to replace mathematics in physics. It is the mastery of human emotions which is capable of acting with such resolve, as Schiller demonstrates. LaRouche provided this crucial missing link when he related the singularity of the physical nature of the caustic of light to the artistic principle of Leonardo da Vinci, and he stressed that the membership of the ICLC should investigate the principle of light in *The Lady of the Rocks*, and Leonardo's non-linear transformation of linear perspective applied to his paintings. LaRouche added this amazing statement about the cycloid:

> "Similarly, the same starting-point gives us access to the family of negative curvatures, a venture to which we may be encouraged by Leonardo

da Vinci's construction of the catenary as a correction done to a spherical mirror to eliminate a caustic reflection. Or, we may be prompted to apply constructive skills to the understanding of the least action forms which are produced by soap-bubble constructions." [11]

Here, Leonardo shows how to go from the method of central perspective in painting to a method of caustic perspective. The change is suggested by Nicholas of Cusa in his conception of the Holy Trinity and the Sphere. Cusa addresses the paradox in the following manner:

"Moreover, it is no less false that the center of the world is within the earth than that it is outside the earth; nor does the earth or any other sphere even have a center. For since the center is a point equidistant from the circumference and since there cannot exist a sphere or a circle so completely true that a truer one could not be posited, it is obvious that there cannot be posited a center [which is so true and precise] that a still truer and more precise center could not be posited. Precise equidistance to different things cannot be found except in the case of God, because God alone is Infinite Equality. Therefore, He who is the center of the world, viz., the Blessed God, is also the center of the earth, of all spheres, and of all things in the world. Likewise, He is the infinite circumference of all things." [Nicholas of Cusa, *De Docta Ignorantia,* quoted by Jason Ross, The Fallacy of the Equant, EIR, Vo. 34, No. 5, February 2, 2007, p. 27.]

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[11] Lyndon LaRouche, *Cold Fusion: Challenge to U.S. Science Policy*, Schiller Institute, August 1992, pp. 68. Lyn's footnote says: The caustic and its correction by parabolic mirror surfaces, are shown in illustrations by Leonardo which can be found in *Leonardo e la technica*, 1978 Instituto Geographico de Agostini, chapter on "L'Ottica di Leonardo," p. 55. For the English reader, this is illustrated in *Executive Intelligence Review*, May 26, 1989. See also *Beethoven as a Physical Scientist*.
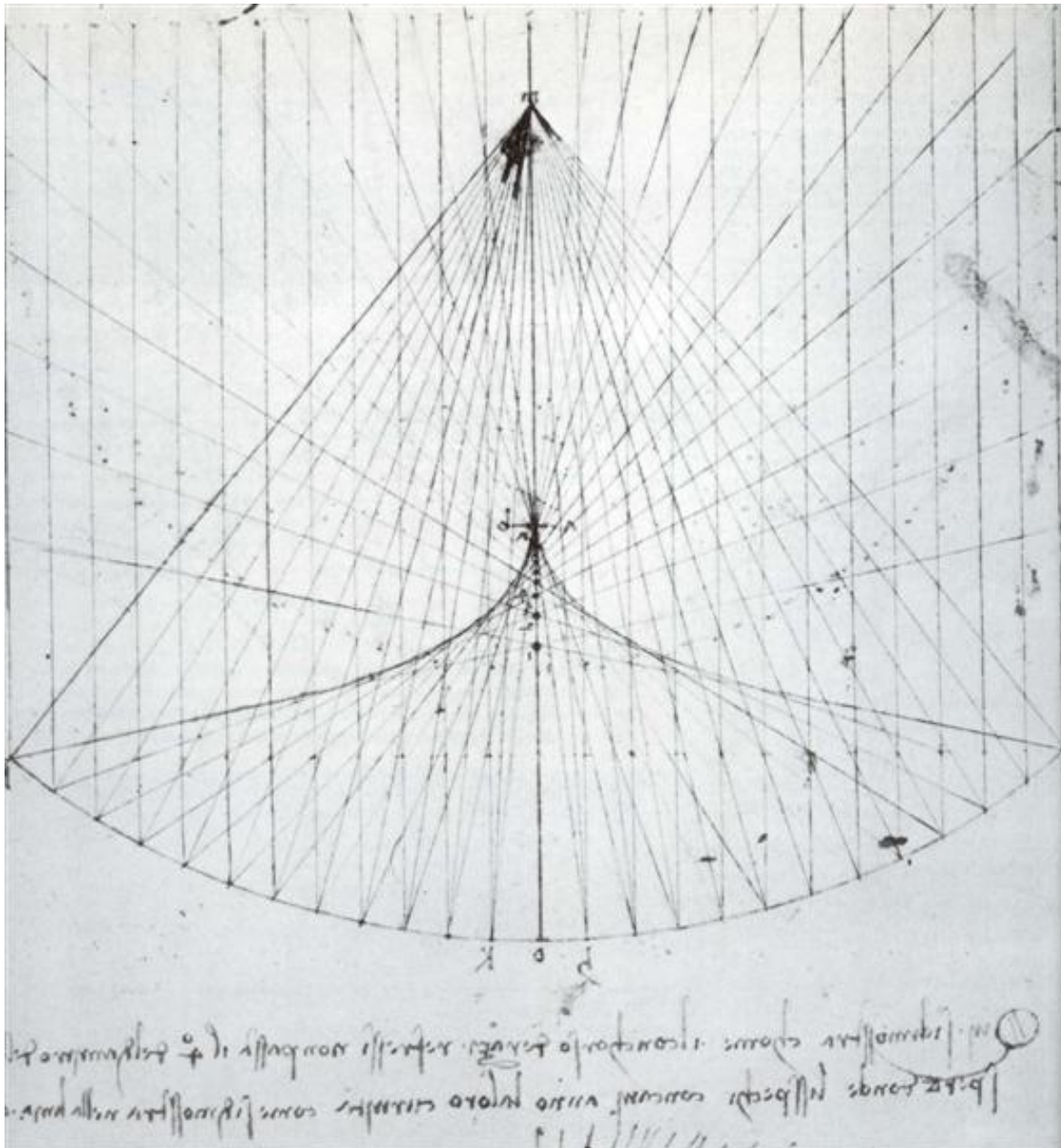
Leonardo Da Vinci's transformation from a perspective point to a caustic of negative curvature.[12]

The statement of Cusa has very interesting consequences with respect to both Leonardo's method of *sfumato* painting and for Roberval's construction of the cycloid. Four points result from this:

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[12] Lyndon LaRouche, *Cold Fusion: Challenge to U.S. Science Policy*, Schiller Institute, August 1992, pp. 52.

1) If the center of the sphere does not exist, then it must follow that the diameter of the sphere cannot exist either; therefore, the maximum straight line inside of a sphere can only be the radius, whose part moving toward the non existing center of the sphere must be transformed into a caustic of negative curvature.

2) If the radius is the maximum straight line inside of the circle, it is also the maximum straight line (indivisible) that can be transported from the circle to the surface of Roberval's cycloid, since the radius is the maximum line that can be generated between the cycloid curve and the sine curve. (See Roberval's cycloid.
https://www.youtube.com/watch?v=Hg1M5h6Rk38)

3) It follows from this that the first possible polygon inside of a circle has to be the hexagon, because the length of its side is equal to that of the radius. As a result of this relationship between the circle and the cycloid, it appears, therefore, that an infinite number of polygons are possible at the exception of the pentagon, the square and the equilateral triangle.

4) Thus, the generation of the circular cycloid acts as a singularity limit between the hexagon and the pentagon, similar to the Asteroid Belt inside of the Solar System, in which the three polygons, which go into the construction of the Five Platonic Solids (pentagon, square and equilateral triangle plus their musical harmonics) are on one side of the barrier and all other polygons or solids must be on the other side.

This means that we have just gone through a complete revolution in the way of thinking of science and artistic composition. The axiomatic change from the simple rotational action of the cycloid to the triply-connected galactic motion of a planet within the galaxy, as identified by LaRouche, is caused by the least action form of change of three different motions into a single one as in the case of the Archytas doubling of the cube: 1) a cycloidal motion creating a new surface that Roberval identified as a surface of triply-connected "indivisibles" between the two companion curves, 2) a toroidal inversion of tangent motion that Leibniz used for the construction of his catenary curve, and 3) a spiral motion that Huygens and the Bernoulli brothers constructed as an "enveloppée" (enveloped curve) and

"développée," (developed curve) which were later translated by "involute" and "evolute" curves.

The key to solving the difficulty of this higher transfinite ordering, here, is to understand Cusa's *coincidence of opposites* between the *tangent to the enveloping process of generating a curve* and the *normal to the developing process of generating a companion curve.* There is an interesting inversion going on here, between the inside (negative curvature) and the outside (positive curvature) of the torus. The three different types of motions come together as a unique triple function of what LaRouche expressed as a unifying conception of the *galactic torus cycle*.

Roberval[13] provided for the triply-connected cycloidal motion of such a process, Leibniz provided for the inside-outside inversion motion of the same process, and Huygens provided for the enveloping-developing motion, later taken up by the Bernoulli brothers and by Gaspar Monge into the higher domain of negative curvature. Each motion contains all three axiomatically different degrees of change. This is how History, Geometry, and Artistic composition come together under a single principle of higher hypothesis. What was missed by the academic scientific community is that the enveloping and developing surfaces had been conceived in accordance with Cusa's notions of what he called the *enfolding* and *unfolding* creative process of the human mind in the simultaneity of eternity.[14] And, LaRouche added that circular action bounds the straight-line domain.

The revolutionary idea, here, is that the different "transcendental functions"[15] forming the curvature of this triply-connected astronomical motion of

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[13] See Gilles Personne de Roberval, *The Cycloid*, from Treatise on Indivisibles, trans. by Evelyn Walker, (New York: Teachers College, 1932) As the titular holder of the Chair of Ramus at the Royal Palace, Roberval was sworn to secrecy about his work, and therefore was not given credit for priority in some of his original discoveries, especially for his doctrine of the infinite or indivisibles respecting the construction of the cycloid. Blaise Pascal saw to it that Roberval would ultimately be recognized as the original geometer responsible for giving the original solution to the construction of the "roulette" or trochoid in his contest known as the "Histoire de la Roulette." According to Pascal, it was M. de Beaugrand who changed the Greek term of "roulette" and "trochoid" into "cycloid."

[14] See, Nicholas of Cusa, *The Vision of God*, E.P. Dutton, New York, Third Edition, 1978, pp. 52-53.

[15] Lyndon LaRouche, *Cold Fusion: Challenge to U.S. Science Policy*, Schiller Institute, August 1992, pp. 66-67. "Each moment, a small length of thread is detached from the catenary, and added to the length of that taut-free thread. At the same time, the angle of the taut thread is changed to correspond to the new point of tangency along

physical space-time are all carried across together as one, in the large as well as in the small, by means of Fermat's principle of least time and by Cusa's isoperimetric principle of least action; that is, they are submitted to the same type of paradoxical action that Roberval had discovered originally in his construction of the cycloid's "indivisibles." This early approach to the calculus enabled problems to be solved with quadratures as opposed to fallacies such as Cauchy's "limit theorem" fallacy. If you don't have closure, you don't have the real world. In other words, the crucial point is that of a new conception of causality; that is to say, causality as change as opposed to occasional bumping each other at a distance and in the dark. Lyn made the crucial point as follows:

> "Instead of limiting causation to the notion of "exerting force" against objects, conceive of change *per se* as a form of causation. To render more clearly intelligible this notion of "change per se," let us borrow briefly from the appropriate medium, the medium of Plato's Socratic dialogue. Consider the transmission of a valid, crucial scientific discovery, generated within one sovereign creative mind, to be assimilated efficiently for successively improved (changed) practice by other minds. How does this causal process of spiritual change function to such material effect? What medium is employed to communicate a spiritual change to such efficient material effect?"[16]

In his groundbreaking science policy memorandum, *Cold Fusion: Challenge to U.S. Science Policy*, Schiller Institute, August 1992, Lyndon LaRouche restored Roberval's revolutionary discovery and related its construction to Leonardo da Vinci's presentation of a caustic as the characteristic singularity of going from a lower to a higher manifold.

Let me recall briefly, here, Roberval's construction and the axiomatic transformation which goes from triply-connected circular action to the complex

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the catenary's right arm. The increment of length is, in each instant, a product of a transcendental function, and the rate of change of the position and the angle of the tangent is also the product of a transcendental function. Thus, the generation of a tractrix's right arm is not the result of a straight line, but of the changes in length, position, and angle of a line generated by a transcendental function."

[16] Ibid, p. 75.

caustic surface of negative curvature. Think of this process as a mental form of change through metaphor.

The point to focus your perplexity on is the *coincidence of opposites between the tangent and the normal of the enveloping and developing composition.* The paradoxical singularity lies in the fact that problems can be solved with unity of opposites and never from the standpoint of conflict of opposites.

For example, the interaction of the two opposite motions of the tangent and normal demonstrates the transformative principle used to cause change. The process caused by a transfinite surface of both positive and negative curvature, created from a higher domain such as what is achieved by Leonardo's teacher, Verrocchio, and by Leonardo in their *David* and *Mona Lisa*, respectively, represents the principle of a renaissance of the creative human mind.

Verrocchio, *David* (Leonardo) *and* Leonardo Da Vinci, *Mona Lisa*

The idea is that such a transformative principle of artistic composition must replace the role that mathematics currently plays in physics. The proof lies in the transformation, not in the calculation, in the causal change of other minds as opposed to the effect of an impact on other minds. Therefore, the paradox of the coincidence of two opposites, as expressed by the caustic smiles of both figures, can only be resolved from a higher anti-entropic transfinite level. Only then, can one realize that what is truly remarkable with both the *David* and the *Mona Lisa* smiles is that they express the coincidence of opposite emotions such as between happiness and sadness, for instance, which is the expression of the idea of the "*sublime*" as understood by Schiller. Such an irony is the equivalent of Kepler's eliminating the fallacy of the Equant by showing how the caustic of mental lucidity works in artistic composition.

Verrocchio's and Leonardo's smiles have captivated mankind for centuries because they have within them the quadratic Lydian power of solving paradoxes which is not simply a "clever visual trick," as some foolish observers have claimed. You must imagine a Leonardo *sfumato* brush stroke such that it mixes light, shadow, and color with three motions of change, inversion, and elimination of contours. The point is that such smiles must be seen as *mental caustics of negative curvature*: that is to say, they represent the same conceptual discovery that Roberval, Huygens, Leibniz, the Bernoulli brothers, and Monge discovered in their axiomatic difference between simple circular linear action and triply-connected galactic torus actions.[17]

LAROUCHE: A CLASSICAL HUMANIST MODE OF EDUCATION AND THE TRANSFORMATIVE PRINCIPLE OF CHANGE

The social conditions under which such universal physical principles can be replicated in society have been clearly established by Lyndon LaRouche in his 2002 essay, *Does Technology Steal Jobs?*

"What is the means by which to promote the development of the ability to generate, replicate, and transmit those non-deductive ideas typified

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[17] Leonardo had similarly used the same creative insight for his two Madonna of *The Lady of the Rocks*. See my report: **LEONARDO DA VINCI, THE VIRGIN OF THE ROCKS**

by experimentally valid discoveries of universal physical principles? A classical humanist mode in education, as opposed to the mind-destroying policies presently rampant in U.S. schools and universities and in today's epidemic of socially induced video games schizophrenia is the problem to be addressed in remedial action.

"This means, that industrial progress requires an increase in the number of persons so employed, and also an upgrading of the average skill levels and standard of living in the households of persons so employed. Other points exposing the fraud of the Malthusian theses will be touched upon in this report. At the present moment, the following points should be read as relevant to that conclusion.

"This means, that a higher standard of living should be defined functionally, in terms of those physical and related changes which foster the increase of that human cognitive potential in the individual, family household, and community affairs of society.

"To realize the potential which cognitive discoveries represent for increasing potential relative population-density, we must, in effect, constantly change the biosphere. Look at this matter within a context which takes us one step beyond Vernadsky's definition of the Noosphere.

"This means improving nature in ways which raise the level of the Biosphere, such as causing deserts to bloom, placing water distribution under human management, fish farming, and so on. In these and other ways, we are helping the Biosphere to reach levels of anti-entropic development it could not achieve without human intervention. This includes applied foresight into managing our relationship to such matters as depletion of fossils of the Biosphere, such as atmosphere and water, such that we are efficiently offsetting our tendency to deplete those fossil reserves.

"This also means, adding an accumulation of "fossils" of human cognitive activity, such as artifacts of man-needed technologies not otherwise available within the bounds of functions of the pre-existing

Biosphere as such. Basic economic infrastructure developed and maintained by government, is an example of this. Physical capital-intensity of investment in production is another example of such man-generated fossils of the Noosphere.

"The combination of such man-made improvements in the Biosphere and Noosphere represents man's physical-economic relationship to his total environment. It is the ratio of man's level of scientific and technological development to the results of such a man-managed relationship to the man altered Biosphere and Noosphere, which delimit, and otherwise determine the possible rate of improvement of the potential relative population-density of our species. The efforts required to maintain and improve that relationship, constitute the determinants of potential productivity of the society, and therefore define the true costs of production for society as a whole.

"The individual place of employment is to be assessed solely in terms of its functional relationship to that relatively universal set of bounding conditions. The determination of the outcome of the employment of the individual operative is properly defined in those relatively universal terms of reference.

"When this matter is examined competently, it is clear that technology, as such, does not 'steal jobs'; technological progress as such requires a change in employment from lower to higher quality of employment opportunities generally. Any different ultimate effect is not the result of technology, but of bad policy, or of bad management, of national governments, banking institutions, or firms."[18]

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[18] Lyndon LaRouche, *Does Technology Steal Jobs?*, EIR, Vol. 29, No. 22, June 7, 2002, pp. 19-20. Note that the idea of "anti-entropy" reflects a double negative action because the fight for the benefit of mankind always implies a fight against the human tendency to degenerate into bestiality. To be anti-entropic is to be against the bestialization of man.

As LaRouche indicated in this magnificent section of his report, it is not the low grade of scalar energy ratios which must be measured, but rather the increase in energy flux-density per capita, which can only be produced by an increase in density of singularities; that is, in discoveries of new physical principles. This section of Lyn's report is a super-gem of axiomatic transformation which actually performs the intention thus stated; that is, which applies the necessary increase in energy flux-density required for a humanist mode of education to be instituted worldwide. In a word, it is as if LaRouche was telling us to pay attention to the fact that we can walk in the footsteps of former discoverers and follow our own footprints of development as we go along.

Lyn's emphasis is that it is the individual human mind which is uniquely capable of dealing with the boundary conditions of the potential relative conditions of change of our species in terms which cohere with the changing universe as a whole. That is why advances in technology do not steal jobs but bring the employment of human labor to a higher level of productivity.

To the contrary, it is globalization which steals jobs with its worldwide policy of financial deregulation and exporting of industrial production into less developed countries. Those are the human made conditions for the emergence of deadly circumstances such as the present coronavirus.

CONCLUSION

No one knows how many people will accept to go through such an axiomatic transformation in the immediate period ahead, and recognize by means of this new transformative principle that Kepler was right in attributing an axiomatic change in the ordering of the solar system as well as in the noospheric power of the human mind. No one knows how such an electrohydrodynamic factor of increase in the general welfare of mankind will be introduced into human society today. However, it seems that the present biosphere conditions being triggered by the coronavirus pandemic[19] is causing the necessary shock effect to prepare the entire human

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[19] This is an excellent documentary on the extraordinary measures taken in China to contain the Covid-19 epidemic. All 14 emergency hospitals that were built have now been closed, since they're no longer needed. from CGTN: https://www.youtube.com/watch?v=XU9FVqwO4TM

population for such an axiomatic change. As Helga Zepp-LaRouche stated in the Morning Briefing of March 11, 2020, this axiomatic change will succeed…

> "…only if you have a complete paradigm shift, where you abandon the liberal system of money and profit first, and go back to the idea that the common good of the people has to be the center of politics, and that we have to go into a massive reconstruction program — not only for the health delivery system, but for food security, the idea of a national sovereign economy. And that can only be accomplished with the Four Laws, the Four Power summit which must take place immediately, because that is the only combination from which the solution can come."[20]

In order to understand Helga's conclusive statement, I highly recommend reading and pondering on Lyndon LaRouche's *EIR* , Vol. 29, No. 22, 2002 essay, *Does Technology Steal Jobs?* and its twenty-two year younger companion, *Economics and Population*, published in *The Campaigner*, Vol. 13 No. 8, October 1980, pp. 2-18. (You must click on page 002 in *Economics and Population* to read the document). These two reports are especially significant because they develop a Platonic method of axiomatic transformation which enables the reader to become a creative human being at the required level of *hypothesizing the higher hypothesis*; that is, at the level of relationship between the biosphere and the noosphere. Therefore, the geometry of creative reason requires that successive scientific revolutions, such as demonstrated since Plato by Augustine, Cusa, Leonardo, Kepler, Leibniz, and LaRouche become the transfinite markers of how to further develop the process of *hypothesizing the higher hypothesis*.

The beauty of this axiomatic shockwave process, triggered by the coronavirus (Covid-19), is such that every part of human society is affected and is being forced to change or to breakdown. That's the first shoe that has already dropped. Nothing can resist its impact and every liberal measure that had been considered acceptable before the outbreak has now become ineffective. Such is the primary evidence of the crisis which is taking place today. The second shoe will

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[20] Helga Zepp-LaRouche, *Morning Briefing*, Wednesday, March 11, 2020.

drop when people realize that it is the fallacy of the popular idea of money which has brought us that disease, because of our failure to organize the biosphere. The next step, therefore, will be the realization by the great majority of the world's population that it is nothing else but the failure of the liberal financial system which has caused such a biospheric reaction to become out of control. As Lyndon LaRouche said in his closing remarks to a seminar in Berlin given on July 8, 2005:

> "The most important thing is, that we're dealing with a world in which there's a conception of money, which is the popular conception of money by governments, and by leading institutions, which, from my knowledge, is insane, by the standard of the effect of the concept, the way it's applied. That the value of money should not be determined based on some current accounting value. That accounting should be banned as a method for determining the value of money.

> "The value of money should be determined by a *scientific* principle, not an accounting principle. And the scientific principle is: What is a physically defensible determination of the will of governments and the ability of governments to perform in creating credit, over the long term, for the development of their economies and their productivities? And therefore, we among nations, should recognize this process, *use* this process, and set *values* in terms of credit, and exchange, on the basis of those determinations, which must be *physical, scientific determinations*. Because, the crucial thing is, what is the physical life of the investment? How is it going to be maintained? And how long is it, and what's its quality? Those are the bases on which you should issue credit: on knowledge of the determination and competence of the government *to create value*, to create wealth, and to have sufficient wealth, *to repay the debt you are creating, in a timely fashion.* This is a physical question, not an accounting question."[21]

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[21] Lyndon H. LaRouche, Jr., *Money Is a Question of Physical Economy*, EIR, Vol. 32, No. 27, July 8, 2005, p. 25.

APPENDIX

HISTORY OF THE TROCHOID, OR CYCLOID, IN FRENCH: *LA ROULETTE*, IN WHICH IT IS REPORTED BY WHICH DEGREES PEOPLE HAVE ARRIVED AT A KNOWLEDGE OF THE NATURE OF THAT LINE by Blaise Pascal, October 10, 1658

[The following is a translation by Pierre Beaudry of the first two pages of Blaise Pascal's *Histoire de la Roulette,…,* Oeuvres Completes, Editions Du Seuil, Paris, 1963, pp. 117-118..."]

"The cycloid is such an elementary line that, aside from the straight and circular lines, there are no other more commonly observable. This line should have been so obvious to everyone that I am shocked to discover that it was not investigated by the ancients, who have left us not a single comment on it. Yet, the cycloid curve is nothing else but the imaginary curve that a nail on the circumference of a wheel traces when it rolls on the ground, from the moment it leaves the ground to the time it touches the ground again after it has made one complete and continuous revolution. The only required conditions for this experiment are that this nail be tacked to the circumference of a perfect circle and that the ground on which it rolls be perfectly flat.

"Father Mersenne, Minime, was the first to bring the cycloid to the attention of European scientists in 1615, after having carefully examined the rotations of wheels, and identified the line with the name of "*roulette*". However, he was unable bring his investigation to a satisfactory conclusion; because he could not figure out the characteristic nature of the curve.

"However, he had, like no one else, a special talent for asking the right questions, even if he was unable to answer them. At least, he had the honor of having brought his discoveries to the attention of scientists, who might not have figured its secret without his help. Surprisingly, he challenged those European thinkers who thought they were able to solve it, among others Galileo, but no one was able to identify the character of the curve and everyone gave up hope of finding a solution.

"Several years had passed when, in 1634, Mersenne met with [Gilles Personne de] Roberval, Professor of mathematics at the King's Court, who told him he was able to solve the mystery of the cycloid and several other problems. Roberval told Mersenne that the area under the cycloid was triple the area of the generating circle. Roberval, then, substituted the French name "*roulette*" for the Greek name of "*Trochoid*." He told Mersenne he had solved his problem, but that he required him to keep its solution secret for a whole year, after which time he would make his solution public. Roberval suggested that Mersenne initiate a contest whereby all of the geometers would be challenged to find the solution to the construction of the cycloid. Thrilled with that challenge, Father Mersenne wrote a letter to all of the known geometers of his time, inviting them to send their geometrical constructions within the year and letting them know that Roberval had already solved the problem without telling him how it was done.

"More than a year had passed when none of the geometers had sent any solution. Mersenne wrote them again, giving them the hint that the cycloid area was in a ratio of 3/1 with the generating circle. In 1635, after this last helpful hint, two people responded with their demonstrations: one was [Pierre de] Fermat, Counselor at the Toulouse Parliament, and the other was [Rene] Descartes. Both demonstrations differed from each other and from Roberval's solution. Looking at all three proposals, the true solution was obvious, because it was as beautiful as it was simple with a process of construction that was clearly the most natural one. And it is by such a process of construction that the author [Roberval] had derived more difficult solutions on this subject which other methods had failed to demonstrate.

"Thus the solution was made public and there was no longer any geometer in France who did not know that M. de Roberval was the original author of that solution; to which he added two more solutions: one was the dimensions of the solid around the base and the other was the solution of the tangents to this curve with a method of composition of motions, which can be so generalized that it may be applied to any curve whatsoever." […]

FIN.