PEDAGOGICAL

THE HIPPARCHUS MACHINE-TOOL PRINCIPLE OF THE ASTROLABE
(In commemoration of the 375th anniversary of the death of Johannes Kepler.)
by Pierre Beaudry
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The Pythagoreans have taught us that the most important thing to know is the relationship between the individual mind and the universal mind, and that the best way to achieve that was by knowing cognitively the ironic anomaly function of the astrophysical sphere of the heavens. As a result of that, a major political fight ensued between the Greek scientific culture of Solon, Thales, Pythagoras, Socrates, and Plato and the sophistry of the Babylonian imperialist Delphi cult of Apollo. The crux of the matter being that if you define the sphere as a three dimensional round object sitting in empty space, your intention were to perpetrate a fraud, whether you know it or not.

Lyndon LaRouche has revived this crucial polemic today, and has prompted his organization to investigate it, with respect to the ancient science of Sphaerics. According to this ancient Egyptian-Greek science, which traces its roots back to the Pyramids of Egypt, a sphere is the characteristic way by which physical space organizes itself around a single surface, which is everywhere at equal distance to its center of curvature, that is, to the central location of a human observer-actor inside of the physical universe. This is the only way to conceive of the universal heavenly sphere, and this is the way the ancient Egyptians and Pythagoreans understood the sphere within the scientific domain that they called Sphaerics. That was also the original universal model within which all physical discoveries of principle were to be made, and among them, Hipparchus's machine-tool principle for the astrolabe.

ASTROPHYSICS VERSUS THE EUCLIDEAN CULT OF APOLLO AT DELPHI

In his treatise on {*Sphaerics*}, Theodosius, the probable teacher of Hipparchus, (Second century BC.) defined the sphere in this precise anti-Euclidean manner. Instead of constructing it, as Euclid did, from the reductionism view of the plane and by the revolution of a semi-circular plane about its diameter, Theodosius constructed the sphere as the expression of the fundamental characteristic of visual space in relationship with the human mind discovering the universe, that is, as the physical locus of change in the universe from a moveable central position of the observer. Theodosius's definition of the sphere was : «{*a solid figure contained by one surface such that all the straight lines falling upon it from one point among those lying within the figure are equal to one another*} ». [Sir Thomas Heath, {*A History of Greek Mathematics*}, Vol. II, Dover Publications Inc, New York, 1981, p. 247. See also Theodosius, {*On Days and Nights*}, MS. Vaticanus Graecus 204.]

Typically, Euclid, who was at the service of the cult of Apollo in Delphi, had plagiarized the Pythagorean Sphaerics on this very subject. About a hundred years before Theodosius, Euclid had lifted this definition of the sphere from the Pythagoreans and had

reduced it to the definition of the circle in the plane, thus, leaving out the content of what the Pythagoreans had developed through the crucial function of Sphaerics. Euclid had thus established the Delphic domain of Flatland as the « new » domain of geometry. As Heath noted in his book, Theodosius recovered and restored the Pythagorean idea of the sphere by restituting the word « solid » in the place of « figure », and by reinserting the word « surface » instead of « line » from the abstraction that Euclid had drawn by hacking truncated sections from the body of Greek science. However, what Theodosius had done, and which British oligarch, Sir Thomas Heath, silently kept up his sleeve, was more than simply restoring the definition of the sphere back to the original Sphaerics of Pythagoras. Theodosius had identified one of the least perceived but greatest frauds of history. The Theodosius rehabilitation of the sphere of the Pythagoreans revealed why Euclid had purposefully excluded the study of Sphaerics from his {*Elements*}.

Euclid had projected what he considered to be a purely {*orthographic equivalent*} of the sphere in the plane, the mere visual slice of a hatchet job. As a result of this apparently inoffensive curve fitting process, the plane figure appeared to be such an equivalent that Euclid obfuscated the astrophysical difference between the circular shadow and the spherical process casting that shadow in the plane. This omission of leaving the sphere behind was the source of the fraud committed by Euclid against the body of an already developed Greek science. In reality, Euclid was preventing the study of a new astronomy to circulate inside of the Greek school system. He was letting the Babylonian magicians peddle their astrology, while preventing the teaching of the Solar Hypothesis that Pythagoras had already introduced in his Italian schools. [See PEDAGOGY OF PYTHAGOREN ASTRONOMY: A 3-50-6/PB_001] Thus, the use of that fallacy of composition led Euclid to replace astronomy by purely speculative geometry based on a priori axioms, postulates, and definitions, or, to be more bluntly truthful about it, to replace astrophysics by sophistry. Riemann had shown in his doctoral dissertation, {*On the Hypothesis which Lie at the Foundations of Geometry*}, that the truncated notion of Euclidean space was merely a particular sort of a multiply extended magnitude, and a false one at that. Lyndon LaRouche recently established the fuller indictment of the Euclid case of sophistry, in the following manner:

"On account of that set of presently urgent scientific requirements, experience has shown me, that to develop competent strategic analysts from among today's population, it is indispensable to ground the education of persons qualified in that field, in an awareness that Euclidean geometry is, chiefly, sprigs cut from valid European science, and then grafted onto the controlling, axiomatic root of a Babylonian misconception of the nature of the universe.

"That is to say, that the principal understructure of the valid discoveries of ancient Greek science was fully, and correctly established prior to both Aristotle and Euclid. What has been passed off upon us as Euclidean geometry and its modernist derivatives, for example, was a backward-turning reaction in science, a backward-turning revision which took the form of chips hacked off from the earlier, original development of a Classical Greek science, as of the Pythagoreans, and passed, like pieces of mosaic, onto a virtual "Flat Earth" type of Babylonian cult.

"As Thales, the Pythagoreans, Socrates, Plato, and other such understood, to understand the universe in which we live, we should ground our approach to understanding the phenomena of that universe, by beginning with the only proper definition of universals available. This meant adopting the view of the stellar sky of a sea-going maritime culture, and mapping the observed process in those heavens as within a great spheroid of indefinitely large diameter: implicitly a finite, self-bounded universe, bounded by what were discoverable by mankind as universal physical principles. Hence, we may say, with special deference to Johannes Kepler, Gottfried Leibniz, Carl F. Gauss, and Bernhard Riemann, and a qualified nod to Albert Einstein, today: a universe which is "axiomatically" {*finite and self-bounded*.}" {Lyndon H. LaRouche, {A LESSON FROM RONALD REAGAN}, in [A5-47-6/LAR501]

Moreover, LaRouche demonstrated how the Shadowland of the number field of rational, irrational, and transcendental numbers had always been expressed by a physical geometric construction, as its foundation, because there is always a physical constructive geometry to be discovered for any form of legitimate mathematics. The case of the construction of the astrolabe in not an exception to this fact. Therefore, the solution to identifying the time of a celestial event is not to be first discovered and expressed by a so-called spherical trigonometry. Those who, like British oligarch, Heath, pretend that the breakthrough in understanding spherical geometry came with the discovery of trigonometry are frauds and liars. Hipparchus, who was the probable inventor of trigonometry, made the point extra-clear when he stated that « for each of the aforesaid facts is proved {*by means of lines*} (διά τών γραμμών) in the general treatises on these matters compiled by me. » (Heath, Op. Cit. p. 258). Thus, all of the means of finding the times of rising, setting, and culmination of the fixed stars, etc., were not first obtained by spherical trigonometry, but by geometric composition of angular arcs of spherical circles, and by physical construction only.

Eighteen centuries after Theodosius had restored the Pythagorean science of Sphaerics, Kepler had redefined the sphere in the same manner, but with the addition of a Christian conception of the Holy Trinity, and with the idea of man created in the Image of God the creator, that is, the acting composer of the universe. In doing this, Kepler had clearly restored both the principle of the Pythagorean Sphaerics and the seminal idea of Nicholas of Cusa from the {*Docta Ignorantia*} back into astrophysics. In so doing, Kepler had taken a definite position in this fight against the Babylonian tradition of the Cult of Delphi and their Gnostics controllers. It is essential to restate, here, the entire Keplerian definition of the sphere:

« First and foremost, all things have been created in the Image of God the Creator, each according to the condition of it's own essence. Since He wished to give the greatest perfection to all things, the Creator had found nothing more perfect in his elevated wisdom, nothing more beautiful, and nothing more excellent than Himself. That is why, thinking about the physical world, He gave it the form that would resemble him most. And so was born the whole gender of Quantities including within it the difference between the curved and the straight, in the most imminent figure of all, the Spherical

Surface. And this one, the Creator was pleased, in his wisdom, in forming it to the image of the Holy Trinity. {***The central point acts as a source for the Sphere, the surface is the image of the intimate point, and we conceive all of the intervals that reach it as generated by an infinite emanation in all directions from the point outside of itself to where there exists equality in all emanations, the point communicating itself in its self-expansion (ampliatio) which corresponds to the surface, varying according to the ratio of density.***} (Emphasis is added) This generates everywhere between the point and the surface the most absolute equality, the most intimate of unity, the most beautiful convenience, connection, relation, proportion, and symmetry. And even though the Center, the Surface, and the Interval are assuredly three, they nonetheless are but one, in a way such that, even in thought, you cannot separate one from the other two, without destroying the whole. » (Johannes Kepler, {***Paralipomenes à Vitellion***}, Chapter 1.6.)

What Kepler had demonstrated was that God existed within the physical geometry of the universe as a whole, and that was expressed by the universal principle of harmonic change, in opposition to the Gnostic Aristotelian and Euclidean conception of God outside of a fixed-no-changing universe. Therefore, the principal characteristic that is common to the Pythagoreans, Archytas, Thaeetetus, Theodosius, Hipparchus, and Kepler, and which is entirely anti-Euclidean, lies in the fact that the sphere is an expression of a self-growing (***ampliatio***) conception of space, that is, a multiply connected universal manifold of change, which includes the Divine Observer-Actor at the center of the discoveries of principle bounding that sphere, as opposed to the Gnostic Euclidean concoction of a three dimensional visual object floating around in empty space, and excluding the Divine Observer-Actor and principles from the universe. It is this Keplerian idea of {***ampliation***} which is the key to the rediscovery of principle of the Hipparchus astrolabe, within the domain of Sphaerics.

THE PROJECTIVE POWER OF THE CELESTIAL SPHERE

The projective power of the celestial sphere, is the power of generating incommensurable but knowable proportionalities, within this self-organizing growth process of what Kepler called spherical {***ampliation***}, as opposed to the simplistic linear equivalence of shadows extracted and separated from an orthographic projection onto an external plane. The polemic of Plato's Cave resides in that difference within the sphere itself. It was from such an idea of {***ampliation***} that the construction of the spherical complete quadrilateral was later developed by Lazare Carnot, for example, at the Ecole Polytechnique, and later by Jean-Victor Poncelet. So, this axiomatic difference of spherical {***ampliation***} requires an explanation, because this is not only the fundamental difference between Theodosius and Euclid, but it is also a reflection of the crucial difference between Plato and Aristotle, as well as between Carnot and Cauchy in both their political and scientific fights. Moreover, this reflected the central polemical issue of method between Leibniz and the Cartesians like the Venetian agents, Abbot Conti and Isaac Newton. Let me illustrate this point with a specific example.

For instance, it is not equivalent to say that « {***any plane section of a sphere is a circle that is perpendicular to the radius of that sphere***} (Theodosius, Propositions 1-

12.) and to say that « {*any chord of a circle is perpendicular to the radius of that circle*} (Euclid III, 16-19.) This Euclidean truncation eliminates a difference of axiomatic power between the two and kills the very possibility of astrophysical hypothesizing. The mathematics may appear to be the same, but the physical and epistemological reality of the projective process represents a fundamental change, an axiomatic transformation from one domain to the other, a change of power, in the sense of Archytas and Gauss, which is also the expression of the crucial difference between man and animal. The one implies an infinite power of change within a self-bounded and finite universe, the other is sophistry of curve fitting without change and drawing circles on a flat indefinite ocean without a shoreline.

THE HIPPARCHUS PARADOX

> […]"You are not raving drunkenness,
>   "You are not cold reason:
>   "You go further than wisdom,
>   "Without exceeding its region."[…]
> Lazare Carnot « ODE TO ENTHUSIASM »

The discovery of the astrolabe by Hipparchus is the result of a projection from the celestial sphere of the complete quadrilateral, which is treated as a generative principle of what is known as stereographic projection within the sphere itself. This is the physical geometry which will later become imitated and ultimately forgotten and replaced by the study of spherical trigonometry. The discovery of principle involved in the geometric construction of the astrolabe stemmed from the same discovery of principle underlying the ancient science of Sphaerics by the Egyptians, Thales and the Pythagoreans, such as Archytas; and it reflected as well the modern treatments of least physical space-time action by Kepler, Leibniz, Carnot, Gauss and Riemann.

To resolve the Hipparchus paradox by construction, you must first draw the profile of a sphere and construct two Almucantar circles (not chords) indicating the North-South limit range corresponding to the Tropic of Cancer and the Tropic of Capricorn. The Hipparchus paradox lies within that range, which is where the Sun travels throughout the entire year, thus, marking the limits, within Shadowland, between Summer Solstice and Winter Solstice. Next, you must locate, with a double conical projection from the south pole of that same sphere, the internal plane projection of the extraordinary anomaly represented by the intersection of the Ecliptic Circle and the Equatorial Circle of that sphere. [Figure 1. The Hipparchus stereographic-conical projection within a sphere.]

There, the sphere generates a very unique type of {*ampliation*}, which consists in {*going outside of its boundary without exceeding itself*}, fixing the spherical pathway of the Sun during the whole year, and locating the Equinoxial East and West points for the study of the daily position of the Sun during the year, and the study of the great solar year of Precession. The discovery of principle of that stereographic projection by Hipparchus of Nicaea was probably the greatest discovery of ancient astrophysics. You have now

discovered the machine-tool principle that created the astrolabe as the noospheric fossil of a universal clock expressing the day, the year, and precession.

The anomaly of the astrolabe lies in the fact that in order to normalize the variation of times that the Sun takes in traveling along the ecliptic, that is, the time the Earth takes to orbit the Sun in a year, the projected image of the Ecliptic circle must be greater than the Equatorial circle of the Heavenly sphere. In other words, the pathway of the Sun is greater than the universe! This incredible irony is achieved by transforming the two identified Almucantar circles into an Ecliptic circle whose two unequal halves are of 6 months duration each. However, this can only be done by exceeding the finite boundary of the Heavenly sphere itself, by means of the complete quadrilateral. In order to accomplish that task, ironically, Hipparchus required going outside of the sphere of the universe!

So, from the northern half of the sphere, the Cancer Almucantar has to be projected downward into a smaller circle against the Equatorial circle, and, from the southern half of the sphere, the Capricorn Almucantar has to be projected upward into a larger circle against the same Equatorial circle. Both circles have to be fused together into a single third circle, which is projected to coincide with and be larger than the Equatorial circle of the heavenly sphere. {*Thus, the Heavenly sphere is extended outside of itself without exceeding itself*}.

This paradox was created deliberately so that the two portions of the Ecliptic circle could be brought together in such a fashion that the months of the winter period between the Equinox points E and W in the South would be proportionately longer than the summer months between the same Equinox points in the North. In other words, the Sun had to appear to be traveling proportionately more slowly or more quickly, inside of the heavenly sphere, depending on which side of the equator it was moving. The longer times had to be expressed by the monthly periods moving closer to the Winter Solstice, while the shorter times needed to be expressed by the monthly periods moving closer to the Summer Solstice. In this way, those longer and shorter times of the astrolabe expressed more precise physical space-time periods of the year than your electronic watch, which does not express real physical-space time at all, because it always marks equal times.

This major discovery led Hipparchus to solve the problem of projecting precise longitude and latitude lines from the spherical domain onto its enlarged equatorial plane, and account for distortions that tend to diminish gradually when parallel longitudes are moved away from the equator. This led him to discover the unique invisible bridge of projective curvature that such lines would have to travel on when it were required to transfer them by maintaining a common ordering principle between the sphere and its internal plane surface. (Figure 2. Internal plane of the spherical stereographic projection: The Hipparchus astrolabe for Leesburg Va. USA 2005.)

The significance of this result means that the angles between the sphere and the plane were not the same, but proportional. In other words, this projection is not « conformal » or « angle-preserving ». It is the incommensurable proportionality between curvedness

and straightness, the singularity between the two different domains, that is the issue here, in demonstrating that a bridge between the two were not only conceivable, but physically constructible. By establishing his universal physical principle in both geographical and astrophysical observations, Hipparchus undoubtedly created one of the greatest scientific breakthroughs of all times. Moreover, the implications of this principle of universal curvature point to a common denominator between this mapping of the ancients, Pythagoras, Plato, and Hipparchus, the classics, Cusa, Kepler and Leibniz, and the modern hyper-geometries of Gauss, and Riemann.

There is an important thought from Bal Gangadhar Tilak that comes to mind about the celestial sphere as being reflected in the mind of the universal self, {*paramatman*}, and which is in total agreement with the Pythagorean Sphaerics, and the universal mind of Lyndon LaRouche. For the Brahman, all knowledge, whatever its object may be, must involve the knower as participating in it. Knowledge is such that the knower is not only part of its object, but he is identical to it at the same moment that knowledge of it occurs and is communicated socially by means of cognition. In other words, all knowledge reveals itself paradoxically as self-knowledge, and its paradigm is best represented by the universal heavenly sphere that makes all human beings resemble God. This is the reason why the observer-actor is located at the center of the sphere, and that is why he is also able to go outside of the heavenly sphere and see himself acting on the universe from this paradoxical external position, and change it for the better. Thus, the observer-actor is self-bounded, but also exceeds himself, by growing and pulling himself enthusiastically out from inside of himself.

Today, the LaRouche-Riemann-Vernadsky approach to the development of the Eurasian Landbridge is a reflection of the same principle of the Hipparchus machine-tool principle of the astrolabe. So, there is no need to be lost on a Flat Ocean without a shoreline, as Euclid and the British oligarchical « science of Flatland » would have you believe. A more complete validated geometric constructive proof of the Hipparchus astrolabe is readily available, without having any recourse to mathematics. Anyone who wishes to know how to construct it, strictly geometrically, as opposed to sacrificing blind faith to the altar of numbers, can reach me at: pierrebeaudry@larouchepub.com

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