From the desk of Pierre Beaudry

KURT GÖDEL'S "CLOSED TIME-LIKE LINE" AND THE SIMULTANEITY OF ETERNITY

by Pierre Beaudry, 4/12/2010.

"The future ain't what it used to be."
Yogi Berra

"Time is a mysterious and seemingly self-contradictory being."

Kurt Gödel

"The issue of the functional role of 'time-reversal,' is the most important of the fundamental issues confronting mathematical physics today."

Lyndon LaRouche

INTRODUCTION: THE ENDURANCE OF TIME

Endurance of small change through singularities is one of the most amazing qualities the universe has in sustaining continuous and big axiomatic changes. Endurance is a characteristic of space-time that is very important to consider with respect to the universe as a whole. It was endurance of a weak force that Kurt Gödel used in developing his conception of the universe in General Relativity Theory with the collaboration of Einstein. The same notion of endurance is also the most appropriate for Lyn's idea of simultaneity of eternity, because the universe expends itself everywhere through small amounts of least action in order to produce its optimum and optimistic development. In all cases, this characteristic of endurance is born of a principle of irony that is built into the very self-developing fabric of the universe as a whole. It is through such processes of small changes and big results that the universe progresses proportionately in the manner that Leibniz conceived of proportionality between power and reason for the purpose of bringing about human happiness. Therefore, I propose the following ironic hypothesis for the pursuit of happiness:

If simultaneity of eternity is to the human mind as happiness is to perfection, then perfection is to change as space-time is to the infinite endurance of the universe.

What happens if you apply the same proportionality to Gödel's conception of the universe? Universal physical space-time becomes infinitely closed onto itself proportionately, as would the growing City of God. There exists, however, no suitable geometry of space-time to express such a function of the singularity of simultaneity of eternity in the universe. However, read Dante's *Divine Comedy*, and you will understand. As for us, we will have to be satisfied with the less inconvenient form of geometry that I will now be considering in this paper.

Let's just say, for the time being, that if motion were change within an interval of space, then, time must be the endurance of that changing interval, and simultaneity of eternity must be the infinitely joyful moment of closure of all changing relative intervals of motion in the universe. Leibniz understood that the proportionality of change between understanding and power was the principle of felicity. Thus, simultaneity of eternity must be understood as the most joyful characteristic of the enduring process of change in the universe. This is the cosmic conception of time that Heraclites was speaking from when he advocated that everything changes and never stays the same. This is why Rembrandt was smiling in his self-portrait with Heraclites at his side. Leibniz encapsulated the idea in this way: "And if the dominant principle in the existence of the physical world is the decree to give it the greatest possible perfection, the primary purpose in the moral world or in the city of God, which constitutes the noblest part of the universe, ought to be to extend the greatest happiness possible." (Leibniz, *Discourse on Metaphysics*, PDF copy, p. 26) Therefore, the question is: How can mankind achieve happiness?

As Leibniz emphasized in his *Metaphysical Foundation of Mathematics*: "If a plurality of states of things is assumed to exist which involve no opposition to each other,

they are said to exist simultaneously." (Leibniz, *Philosophical Papers and Letters*, Kluwer Academic Publishers, The Netherlands, 1989, p. 666.) If this is the case, then it will stand to reason that since everything in the universe changes all the time, it is appropriate to assume that everything changes simultaneously without opposition, and that the form of time the universe take must be considered as being in the simultaneity of eternity for any human observer. This is the kind of time in which human creativity is expressed and within which large phenomena of change take place, such as rotating galaxies and cosmic radiation. In other words, this is the time in which the universal ordering of things is changing, simultaneously.

However, since the simultaneous change of the universe involves different relative magnitudes of physical space-time, the enduring of events in the universe will not be simultaneous, but relative to different observations. That is to say, all events in the universe change relatively to the simultaneity of eternity of the universe as a whole. And, since time does not vanish and disappear, one moment after the other, as do present moments that positivists waste all the time, the magnitude of the instant becomes an uninteresting mathematical zero to be discarded, just as the point zero in spatial magnitude.

We should have not problem, here, in conceiving that all things in the universe, inclusive of the three phase-spaces of Vernadsky, the a-biotic, the biotic, and the cognitive, are subject to continuous change in mutual relative simultaneity of eternity, that is, each in their own time. The difficulty appears when certain physical, biological, or mental processes come to a limit. Up until then, the continuous process of change is fairly smooth and does not proceed by leaps and bounds. As Leibniz would say, the *situs* or path of relationship of coexistence between several simultaneous things are continuous and without interruption. However, when suddenly, something happens that cannot be explained and the continuity is interrupted, the simple continued coexistence between things becomes threatened. Why? Because, somewhere along the closed time-like curve of change, there is a process that stopped changing. A limit had been reached that was imposed by change, and because the pathway of change was blocked, the process degenerated and collapsed. The simultaneity of change in the universe got dislocated and the co-existence of change came to a halt.

The interruption occurs because there does not exist an infinite number of paths in which things change in the universe. There is only one pathway, and it is always the simplest. Therefore, an axiomatic singularity emerges only when change in the least action path between things is interrupted. When that pathway remains unused for a period of time, as the arrest of progress in economic development in the United States from 1968 until 2010, the universe gets upset and causes a crisis for whatever was supposed to use that path, but did not. As Leibniz put it: "If this were not the case, there would be no order and no reason for distinguishing among coexisting things, since one could pass from one given thing to another by any path whatsoever. It is this minimal path from one thing to another whose magnitude is called distance." (Leibniz, Op. Cit, p. 671.)

This brings us to the question of Gödel's idea of the time of the universe as a world curve, or a closed timelike curve. However, beware that this might give rise, as it did before, to the absurd and fictitious notion of physical time travel. The illusion of traveling in time came from a distortion of Gödel's ideas in cosmology and the fact that fools were made to believe that the theory of relativity was in agreement with physically traveling foreward or backward in time, through wormholes and the like, in manners that bypassed the constraints of physical space-time. Although he did consider such hypothetical travel, Gödel considered the physically impossible. However, Gödel had also conceived of the idea of a closed timelike curve in which time was not wasted and proceeded by inversion. That is the issue that I now wish to discuss.

1. THE AMERICAN VS THE BRITISH NOTION OF TIME.

It is not accidental that Gödel's new conception of time for the General Theory of Relativity matured in the United States in the company of Einstein, as opposed to Europe where the idea was born. These two notions of time reflected, in more than one way, the existence of an axiomatic difference between two time zones of two completely different views of the world, one Republican and the other Oligarchical. When Gödel discovered his solution to the field equations of the General Theory of Relativity, with his new conception of "closed timelike curves," he was clearly opposed to the Russellite and Newtonian notion of time that admitted only of a unidirectional time manifold in the straight-line succession of the past, present, and future.

Although the General Theory of Relativity admits of this linear conception as reflected by the Minkowski flat notion of special relativity, the newly developed conception of time for the GTR was meant to revolutionize physics a second time in the short time period of only 50 years. Indeed, if Einstein was the genius who captured and tamed the misunderstood and elusive notion of time and succeeded in establishing its limit by means of the speed of light, and its proper functioning as the fourth-dimensional companion of space, Gödel was his genial companion who elevated time to the highest degree of the sublime by identifying time-reversal as the true curvature of our creative four-dimensional-relativistic-physical-space-time universe. Outside of Lyn, Gödel seems to be the only scientist who made use of time-reversal.

The revolutionary time-reversal idea is precisely what made the Gödel time an "ideal time" of physical space-time, and this is precisely what most commentators, including Palle Yourgrau did not understand. Yourgrau noted astutely the difference, but he did not realize how far the beacon light of Gödel mind would reach, and therefore, he confessed, sort of under his breath:

> " At a faculty dinner at the institute the young John Bahcall, having introduced himself as a new astrophysicist on the faculty, was taken aback when

> Gödel replied flatly that he didn't believe in natural science. By Gödel's lights, physics had taken a wrong turn centuries ago when it chose to follow the path laid by the naturalistically minded British empiricist, Isaac Newton, rather than that of the German idealist Gottfried Leibniz. Gödel's fascination with Leibniz was boundless, prompting a mathematical colleague, Paul Erdös, to offer a rebuke: 'You became a mathematician,' he told Gödel, 'so that people should study you, not that you should study Leibniz.' " (Palle Yourgrau, *A World Without Time: The Forgotten Legacy of Gödel and Einstein,* Cambridge, Basic Books, 2005, p. 15.)

Yourgrau did not realize how true his statement was. This exquisite story sheds a light that has been obscured for centuries about the very nature of science and politics that have been hidden deeper than the roots the author thought he was revealing, namely the fundamental and irreconcilable agreement between Newton and Leibniz, and between the British imperial system and the American system of political economy. As I will show later, both Einstein and Gödel were very much aware of this fact and their politics were an important sealing factor in their unique friendship and collaboration on this side of the Atlantic. However, the issue here is not political with a small "p" but Theological with a capital "T." The idea of "idealism" that has been reproached to Gödel has been misconstrued and misunderstood. Only fools understand "ideal" to mean "not real" and "not-objective." The matter is, in fact, conceptual and epistemological: the question is how to determine whether God is inside or outside of the universe. That is the whole question that is underlying Gödel's notion of time. So, we have to distinguish between two different conceptions of time: one is British and imperialist, the other is American and republican.

Political events that shape the world as a whole are very similar to universal scientific events in physical space-time. Both types of events can be developed on closed timelike curves that would endure by mutually twisting around each other to form a unique geometry of a Gödel-Einstein-Vernadsky-LaRouche physical economy. Why? Because both political and scientific events are envelopped by the simultaneity of eternity. The central feature of this Gödel model of the universe is not consistent with our sense perception of time, but is perfectly consistent with Lyn's idea of time-reversal in the simultaneity of eternity, and with Einstein's general relativity. Gödel did not propose a hypothetical geometric model for his conception of time, so I am proposing the least inappropriate spatial model I could find to represent it. See Figure 6.

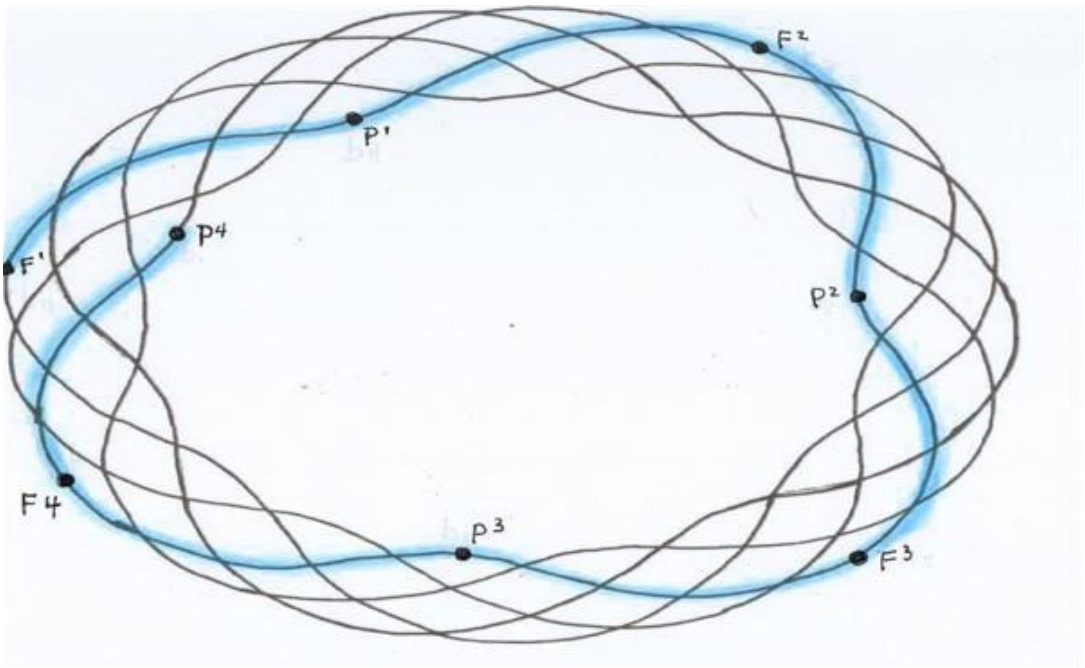


Figure 1. The time-reversal pathway of a closed timelike curve. If physical space-time in the universe is finite and unbounded, then, both space and time must have closure and neither can go out of existence. The connecting points P and F of this elliptical function are measured by the changing process between Past and Future relationships. Here, the present has no existence except to represent change in the flow between past and future cycles.

The axiomatic epistemological condition for this model of space-time to work is to eliminate the false notion of time represented by the instantaneity of the present, the past, and the future. Each of those so-called "moments of time" are fallacies of composition which come into existence and pass out of existence never to return as mere illusions, as shadows of things that never existed. Instants are like points, they are purely mathematical concoctions. This ludicrous popular conception of the instant must be thrown out and replaced with the truth of a universal physical flow of change. Although the General Theory of Relativity admits of the two time functions, the linear division into different moments and time-reversal in the simultaneity of eternity, it is the time-reversal endurance of physical space-time process which is the most appropriate notion of time with respect to the universal principle of finiteness and unboundedness of the universe.

However, there is no reason to fear the considerable effects of the fallacy of composition of the British notion of time as lapsing instants into oblivion, because the mental damage that such a notion of time may have caused in the past can be repaired provided that time no longer be observer independent. What must be done is to consider the present as nothing but change between the past and the future, and once you internalize this reality with all of your attention, then the present will simply vanish as if it never existed, because it never did; and then you will realize that there really was never any room between the past and the future for anything to exist except change. This

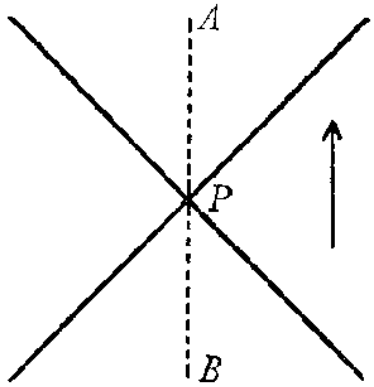
dissapearance of the illusion of the present will also make the other fallacy of composition of absolute time dissapear. Thus, the British concoctions of the present and of absolute time are sense perception concoctions that never existed. What does exist is physical space-time which is entirely observer dependent. That is the "ideal" time of Gödel.

Similarly, the past cannot any longer be considered as the total sum of the presents that have elapsed and no longer exist. The past is the fuel that the future must use to burn the present into change. In the universe as a whole like in human history, that is to say, in the physical memory of the stars as in human memory, true time is represented by the enduring flow of change, and that flow is always determined from the future. This dynamics of time is the central feature of time-reversal causality which does not imply the idea of physical time travel, but implies a conceptual return to a past time that has to be changed. Thus, time changes all the time and in all of its aspects; it never dies, because it keeps returning to its proper universal residence in the simultaneity of eternity.

The difference from the usual way of thinking about time is that, although it may not entirely be present to universal consciousness at this time, time must always be changing, that is, it must always be an enduring resource for changing the present by means of universal physical principles, otherwise there is no time at all. In other words, physical space-time is an enduring continuum following the geodesics of a universal finite process in which the past is not what no longer exists, but what is rejuvenating the present course of events in the simultaneity of eternity with the future. Such is the significance of time-reversal. This closed process is the central anomaly of the paradox of time-reversal causality in which the cause does not precede the effect, but comes after the effect from the future. Time-reversal means that the future purpose is the motor for change to be effected in the present. The future-oriented closed timelike curve reflects the same form of endurance that Gödel used in order to unmask Russell with his Incompleteness Theorem.

However, Einstein seemed to be perplexed with what Gödel had done in bringing closure to physical space-time, but he was also very happy because he knew that the cosmic radiation from gallaxies did not waste itself in some dumb and silent abyss outside of the universe. What Gödel implied was not the physical return to a past time, but the hypothetical possibility of time-reversal. This is why Einstein considered Gödel's idea of closed timelike curve very seriously when he wrote his famous response to criticisms against the theory of relativity:

> "Kurt Gödel's essay constitutes, in my opinion, an important contribution to the general theory of relativity, especially to the analysis of the concept of time. The problem here involved disturbed me already at the time of the building up of the general theory of relativity, without my having succeeded in clarifying it. Entirely aside from the relation of the theory of relativity to idealistic philosophy or to any philosophical formulation of questions, the problem presents itself as follows:



If *P* is a world-point, a "light-cone" ($ds^2 = 0$) belongs to it. We draw a "time-like" world-line through P and on this line observe the close world-points *B* and *A*, separated by *P*. Does it make any sense to provide the world-line with an arrow, and to assert that *B* is before *P*, *A* after *P*?

Is what remains of temporal connection between world-points in the theory of relativity an asymmetrical relation, or would one be just as much justified, from the physical point of view, to indicate the arrow in the opposite direction and to assert that *A is before P*, *B after P?*

In the first instance the alternative is decided in the negative, if we are justified in saying: If it is possible to send (to telegraph) a signal (also passing by in the close proximity of *P*) from *B* to *A*, but not from *A* to *B*, then the one-sided (asymmetrical) character of time is secured, i.e., there exists no free choice for the direction of the arrow. What is essential in this is the fact that the sending of a signal is, in the sense of thermodynamics, an irreversible process, a process which is connected with the growth of entropy (*whereas, according to our present knowledge*, all elementary processes are reversible).

If, therefore, *B* and *A* are two, sufficiently neighboring, world-points, which can be connected by a time-like line, then the assertion: "*B* is before *A*," makes physical sense. But does this assertion still make sense, if the points, which are connectable by the time-like line, are arbitrarily far separated from each other? Certainly not, if there exist point-series connectable by time-like lines in such a way that each point precedes temporally the preceding one, *and if the series is closed in itself*. In that case the distinction "earlier-later" is abandoned for world-points which lie far apart in a cosmological sense, and those paradoxes, regarding the *direction* of the causal connection, arise, of which Mr. Gödel has spoken.

Such cosmological solutions of the gravitation-equations (with not vanishing A-constant) have been found by Mr. Gödel. It will be interesting to

weigh whether these are not to be excluded on physical grounds." (Albert Einstein from *The Library of Living Philosophers* Series (1949) Einstein's Reply to Criticisms from ***Albert Einstein: Philosopher-Scientist***, Cambridge University Press, 1949.)

The important point to be elucidated here, which Einstein expressed by stating: "What is essential in this is the fact that the sending of a signal is, in the sense of thermodynamics, an irreversible process, a process which is connected with the growth of entropy (*whereas, according to our present knowledge*, all elementary processes are reversible)." Thus, what Einstein is asserting is that, contrary to thermodynamic signal sending (viz. second law of thermodynamics), all elementary processes in the Universe are anti-entropic and the reversibility of elementary processes must be considered from that vantage point. The important question to be elucidated, however, is how to conceive of the concept of reversibility in an anti-entropic process.

As Gödel pointed out in his paper on a new type of cosmology, the main idea was to distance himself from Edwin Hubble's view of an entropic universe. This meant that, implicitly, since the universe is everywhere dense and anti-entropic, the hypothesis of time-reversal is required. In his opening statement, Gödel stated:

> "All cosmological solutions with non-vanishing density of matter known at present have the common property that, in a certain sense, they contain an "absolute" time coordinate, owing to the fact that there exists a one-parametric system of three-spaces everywhere orthogonal on the world lines of matter […]
>
> Every world line of matter occurring in the solution is an open line of infinite length, which never approaches any of its preceding points again; but there also exist closed time-like lines. In particular, if P, Q are any two points on a world line of matter, and P precedes Q on this line, there exist a time-like line connecting P and Q on which Q precedes P; i.e., it is theoretically possible in these worlds to travel into the past, or otherwise influence the past." (Kurt Gödel, *An Example of a New Type of Cosmological Solutions of Einstein's Field Equations of Gravitation*, General Relativity and Gravitation, Vol. 32, No.7, 2000, p. 1410.)

The first point to make, here, is that Einstein and Gödel are not merely talking about physical time travel. The hypothetical idea was meant to force people to go to the limit of their creative powers. By considering time travel, Gödel was not "killing time" as some stupid authors claimed, but he was investigating the ironic fact that if you could go back and change the past, then you would have caused a new revolution in general relativity, since you would have demonstrated that the so-called "passing of time" is a mere sense perception illusion and that, in fact, true creative time does act on changing the past as well as the future, when it pertains to simultaneity of eternity. As for the possibility of meeting with a self-contradictory situation of time travel, i.e. the so-called "grandfather paradox" Gödel warned that if one were to go back in time, to be careful not

to kill one's own grandfather before he gets married. Otherwise you will have some difficulty in coming back.

The difficulty that scientist and philosophers alike have with Gödel's idea of time-reversal lies in the Einstein paradox of a universe that is both finite and unbounded. How can a time-like curve reflect infinite change and be closed at the same time? The most important form of traveling back in time is conceptual, and it involves the proper treatment of memory functions. This involves making discoveries that change certain characteristics of one's own past mental life and the past life of mankind in a manner such that whatever the circumstance of a past event may have been during a more or less great period of time, it could be modified for the purpose of influencing a future course of events. In other words, there is not going back in time without a change in the domain of principles. What is changed is not the past, as such, but its usefulness.

For example, a discovery of principle changes everything in your life, including your own past live. Your life is no longer the same. Things that you used to appreciate are no longer appreciated in the same way. Things that you used to be afraid of are no longer fearful. You understand new things about the past that people around you don't understand, and don't even suspect exist. Certain things of the past that were considered important and others unimportant have become inverted. Even some past historical facts that were formerly completely forgotten or ignored have now become necessary and have taken unforgettable significance. Thus, the past can be changed because some new discovery of principle has been made to change the enduring value of time as a whole. So, from that vantage point, there is no doubt that the past can be changed, but only for the purpose of changing the present course of current events.

So, let's take Gödel's insight into the reversibility of time a step further and apply the idea to the three phase spaces of Vernadsky by adding to them a forth dimension, that is, the dimensionality of creative time-reversal. From that vantage point, creative time reversal becomes the most important form of time in the universe.

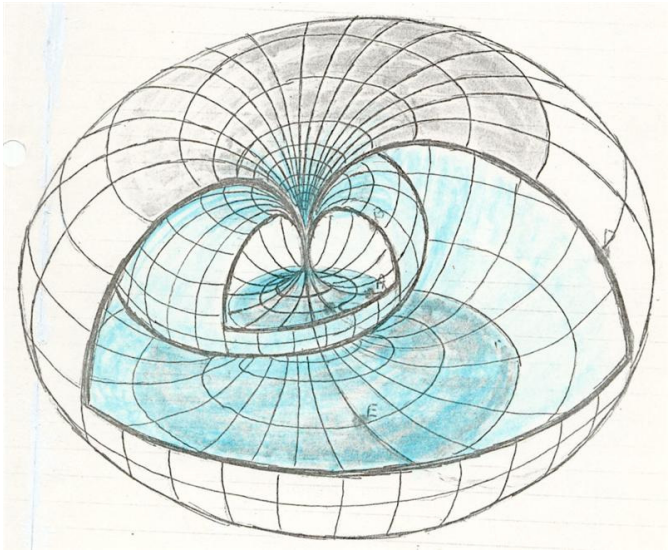


Figure 2. An imagined reversibility of space-time within a triply connected spherical-toroidal manifold, with the added spherical geodesic features of a fourth dimension of time for the creative process of the universe.

First, it is essential to note that a universe which is characterized by closed timelike curves as in Figure 2, must corresponds to a closed universe in the manner that Einstein understood it as being finite and unbounded, and secondly, it must also imply some form of rotation on itself as if around an axis of complex geodesics where cosmic radiation is not lost into a bad infinity, but is captured and harvested within the universe itself, as a constant flow of micro-nutrients returning to feed non-living, living, and thinking processes. In other words, the cosmic radiation that has been wrongly imagined to shed itself outside of the universe is actually coming back after a full geodesic period of time. However, the dynamic tension of time endurance is different for each manifold, but also, acts simultaneously on all three manifolds, but the spherical geodesics are not sufficiently interacting to satisfy the process. What is required is an ellipsoid sort of integration of all three times simultaneously. From that standpoint, a Gödel universe is consistent with the Einsteinian conception of a universe that is everywhere dense, and progresses by increasing its energy-flux-density through a triply connected Vernadskian manifold of an elliptical character. Remember that this is a mental image not a visual one.

Here, in the triply connected Vernadskian three-dimensional manifold, we can further imagine the presence of a fourth dimension of time as expressed by a single continuously-closed-geodesic-line like that of a rotating open ended ellipse (Figure 8) [To avoid the paradox in physical space-time, the ellipse cannot be closed, because as soon as you close it, the universe stops growing.] representing the unity of three different successions of time juxtaposed over space and returning to itself as changed, as if multiple times were traveling on the least action geodesic line of a closed yet unbounded rotating spherical ellipsoidal pathway. The center of the elliptical torus may be conceived as the axis of dissymmetry region of axiomatic change between the three manifolds.

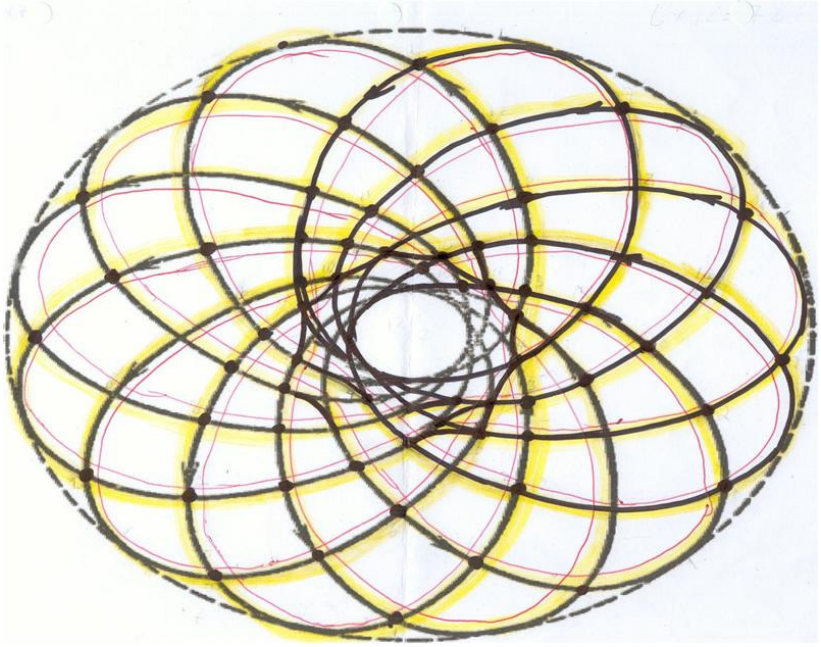


Figure 3. Modified rotating elliptical path of a star inside of a Gödel galaxy. Gödel calculated the period of rotation of a galactic system as averaging $2 \cdot 10^{11}$ years. This modified rotating ellipse represents a poloidal circumference of 7 and a toroidal circumference of 12. The total measure of the cyclical change in the space-time intervals is 6 x 12 = 72.

I wish to add one last element of caution here. The principle of dynamics as Lyn develops the idea from Leibniz is not a principle of symmetry. Dynamics is fundamentally asymmetrical, like the Leibniz principle of proportionality and harmony. It is asymmetry which essentially characterizes an Einsteinian and Gödel universe, because as in the Keplerian universe the pathways of a star are not along circles, but along rotating ellipses. However, beware of how your geometric construction is conceived. Looks can be very deceiving when they are not tested against harmonics. If you conceive of the motion of a star within the static galaxy, the motion of the star will appear to you as that of a rotating ellipse. However, if you are looking at the motion of the same star from the standpoint of the rotation of the galaxy, the pathway of the star will appear as a spiral. Both the elliptic function and the logarithmic spiral must be measured against the well-tempered musical system based at C-256. Therefore, you are well to keep that in mind when Gödel remarked at the end of his paper on rotating galactic universes: “The World lines of matter in these solutions, however, are not equidistant: neighboring particles of matter, relative to the compass of inertia, rotate around each other, not in circles, but in ellipses (or, to be more exact, in rotating ellipses).” (Kurt Gödel, *Rotating Universes in General Relativity Theory*, in General Relativity and Gravitation, Vol. 32, No. 7, 2000p. 1427.)

Next, we can now take a step further and imagine different flows in the simultaneity of eternity, or in their separate closed motions, reflecting the ability to divide or to change inside of each manifold, but without separating them. Thus, infinite succession can be converted into either simultaneous juxtaposition or eternal succession. Two such manifolds could become mingled in their separate courses like the metaphorical flows of residues of quadratics and primitive roots of prime numbers in their respective fields of congruence, and without affecting each other.

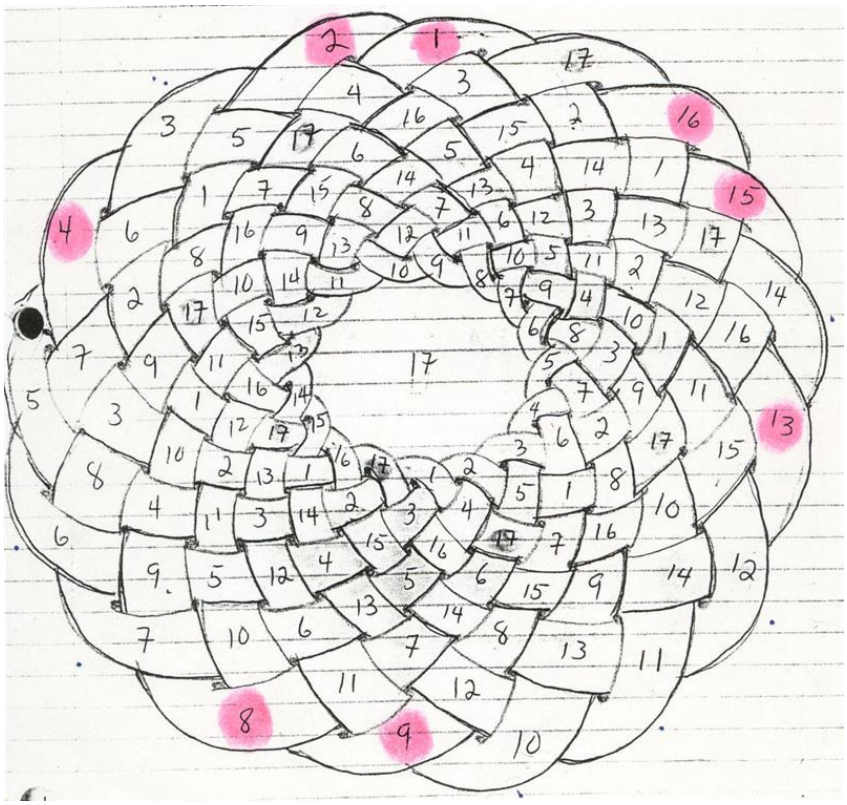


Figure 4. The poloidal wave of 9 intervals rotates clockwise as a quadratic residue of the toroidal cycle of 17. Each number along the rim of the torus represents the beginning or the end of a periodic cycle. This represents metaphorically closed timelike curves where the infinite succession of a periodicity of 17 intervals of action separates the universe into two different cyclical manifolds within itself, one of 8 quadratic and biquadratic residues 9,13,15,16,8,4,2,1, and one of 8 primitive roots 3,5,6,7,10,11,12,14. These two closed timelike curves do not interfere with each other, yet they are integrated in the same higher manifold.

It would not be unnatural to admit that the flows of separate times of certain events of the Biosphere and of the Noosphere could be separated by similar successions of time identified with different geodesic distances, as they are expressed by this analysis situs of quadratics and primitive roots. The waves of the pink colored quadratic residues around the rim of the torus (Figure 9) only rotate within their identified colored numbers, and only in that ordered sequence. The same rule applies to the other non-colored numbers around the rim of the torus, because they are all primitive roots. Thus, the two manifolds underlying the geometry of primitive roots and quadratic residues overlap each other, but never interfere with one another. The two manifolds are separated like oil and water yet they belong to the same flow of analysis situs. They represent two different time cycles in the simultaneity of eternity. Thus, we can imagine such a universal weave of things between two manifolds within a higher simultaneity of eternity.

2- CHIRALITY AND REVERSIBILITY OF ELEMENTARY PROCESSES.

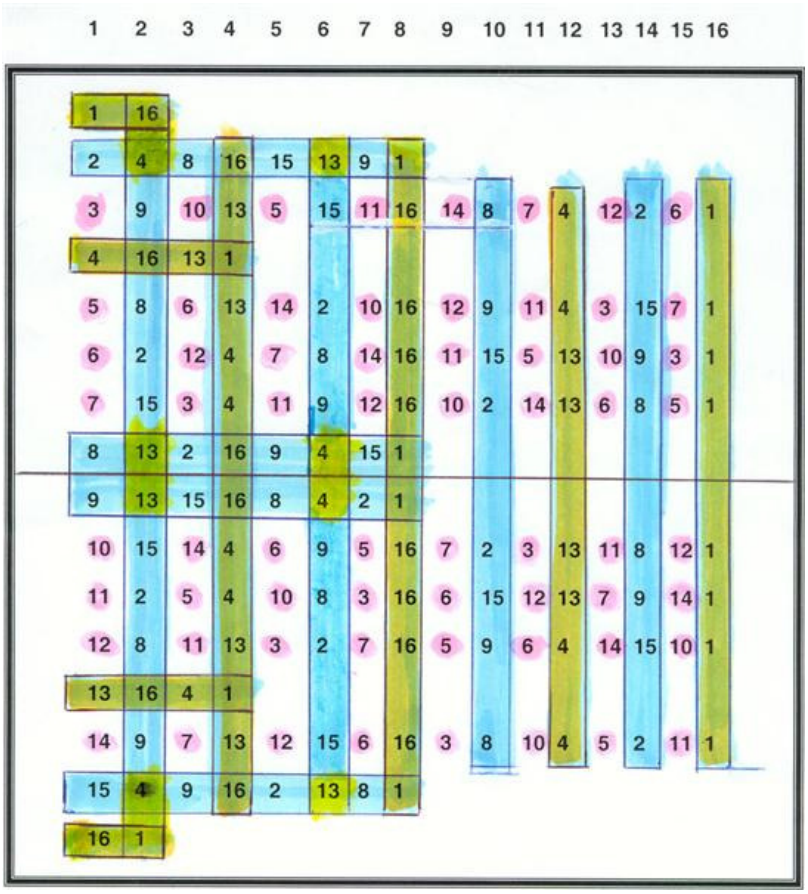


Figure 5. The harmonically distributed quadratic residues, biquadratic residues, and primitive roots of prime number 17. Note that the chirality symmetry among the 4 quadratic residues 2,8,9,15 (blue), the 4 biquadratic residues 1,4,13,16 (green), and the 8 primitive roots 3,5,6,7,10,11,12,14, (purple) does not appear in Figure 9.

Lastly, take the case of the torus of Figure 9 and compare the harmonic cycles of the different quadratic, biquadratic, and primitive root motions with the static harmonic distribution of the same whole numbers of Figure 10. Note the chirality of the system. This analysis situs hypothesis is neither a Gödel nor an Einstein hypothesis, but it is completely congruent with their view of the universe. However, as it was with Einstein, Gödel's anagogical representation of time of the universe was in complete opposition to the Hubble conception of the universe based on the underlying assumption of the big bang singularity, which was merely invented to justify the logic of entropy as expressed by the second law of thermodynamics. On the contrary, Gödel's conception is based on Einstein's general relativity and its Keplerian harmonic conception of gravitation, which is everywhere dense throughout the universe.

Moreover, Gödel's notion of time was not the psychological duration (la durée) of Henri Bergson, but, rather, a universally enduring form of physical space-time which implied least action enduring change. In that sense, "endurance" is a way of making the time of galaxies congruent with the creative time-reversal aspect of the human mind. Time is no longer considered as a succession of percussive instant-like particles acting and reacting against each other in proximity or at a distance, but as expressing universal change within the processes of a continuous field of interaction affected by singularities. It was in that sense that Einstein and Gödel posed the question of reversibility of time in a manner very similar to what Pasteur had developed in demonstrating chirality of living processes that Vernadsky also later investigated.

As Einstein did, Vernadsky also considered that the single irreversible direction of a polar vector of time expressed entropy and suggested that something should be done to change that reductionist situation. However, as far as I can ascertain, neither Einstein nor Vernadsky suggested any specific hypothesis to replace the false assumptions of entropic space and time. Undoubtedly, they were thinking of an anti-entropic form of time-reversal, as Lyn expressed it, in the form of creative time. However, both Vernadsky and Gödel pointed quite forcefully toward the idea of understanding the question of "reversibility" as being a characteristic of time not to be discarded in the universe.

For his part, Vernadsky was taking his investigation of living and cognitive processes in the direction that Pasteur had traced out. In fact, his interest seemed to be focused on the geometrical question of symmetry that Pasteur treated with respect to the chirality (enantiomorphism) of asymmetrical crystals in living processes. (See Vladimir I. Vernadsky, *The Biosphere*, A Peter N. Nevraumont Book, 1997) Moreover, the transformation of solar energy into chemical energy and molecular energy are different examples of how biogeochemical cycles in living processes are inversions of processes found in azoic matter. As Vernadsky noted, the biogeochemical history of living matter of the Biosphere is increasing the energy of the universe as a whole by means of reversible processes. (W. Vernadsky, *La Biochimie*, Paris, Félix Alcan, 1924, p. 339.)

The point to be made on chirality or reversibility is very important because it touches on the essential feature of physical space-time that expresses *reversibility* of space and time in both the Biosphere and the Noosphere. But, chirality is merely the casting of a shadow that can express both clockwise and counterclockwise motions in space, as well as right-handedness and left-handedness, but its most important shadow is to express reversible motion, that is, foreward and backward as a process of inverse transformation in space-time. In both cases of space and time, it is the reversible directionality factor of the change that is important to reflect on, and not the right or left shadow orientation.

Figure 6. Reversibility in small escargots.

The most notable aspect of cognitive inversion processes, which has profound implications for the future of mankind, is the character of time-reversal in a creative process. Outside of Lyn, very little has been said about this inversion of time**,** that is, about the forms of action that the future can have on the past or that the past can have on the future. With respect to time, one can conceive of two forms of temporal return within a closed system, one is full cyclical motion, and the other is reversibility. Universal creative motion of physical space-time can express both of these features simultaneously at any time during the course of an enduring process of change. Thus, it is important to know how time comes back by cyclical closure and how it comes back by reversal of direction.

It is important to note, here, that there are also two distinct but interconnected forms of inversions of time from the present onto the past that have been emphasized by Schiller and from the future onto the present by Lyn. Considering the same inverse directionality in both cases, the first was articulated for the purpose of establishing a foundation to universal history, and the latter for the purpose of long-term projects of future human economic development. They are the same process of time reversal when viewed from the vantage point of creativity, and both of them can be evaluated at any time during closed the cycles of time allocated to the process in progress, because both processes are poloidal and toroidal in character.

The form of time reversal identified by Schiller in his first lesson on Universal History emphasized the fact that it is wrong to look at universal history by starting from the past. Universal history is the history of the changing course of current history. The function of universal history is to focus on changing the present, because this is the precondition for the future one wishes to have. It is the changing present that is the subject of universal history, and it is universal history that leads the willing Promethean man to change his present society for the better, while it drags along the unwilling and the poor fragmented souls trailing behind. The only true significance of the past is, therefore, for the purpose of understanding how the present world situation should be modified, and given new improved boundary conditions for the future. As Schiller wrote:

> "Out of the entire sum of historical events, the universal historian selects those which have had an essential, irrefutable, and easily ascertainable influence

> upon the contemporary form of the world, and on the conditions of the generations now living. It is the relationship of an historical fact to the present constitution of the world, therefore, which must be seen in order to assemble material for world history. World history thus proceeds from a principle, which is exactly contrary to the becoming of the world. The real succession of events descends from the origin of objects down to their most recent ordering; the universal historian ascends from the most recent world situation, upwards towards the origin of things." (Friedrich Schiller, *Poet of Freedom, Volume II*, Schiller Institute, 1988, Washington DC, 1988, p. 267.)

Therefore, universal history is not determined by a personal selection of past events for the satisfaction of the present, but by the future yet to come. There are precise events that shaped the world as it came to be, and which have to be rediscovered if one is to understand where humanity is going. It is in that sense that history is determined by the willful actions of man. In other words, there are very specific historical events that have established the current constitution of the world, and they must be reevaluated in every nation in the world, for better or for worse. As Schiller also noted, in addition to creating an "enkindling light in your mind, and a charitable enthusiasm in your heart," universal history will also make you relive the great moments of axiomatic changes of human history in a manner such that the individual passes consciously from his individuality of physical space-time, from his own historical specificity, into the universality and immortality of the species; but, only for the explicit purpose of improving the coming generations. That is the most important form of cognitive time-reversal notion of immortality, because it is only from this vantage point of the human will that the second form of time-reversal, causality from the future**,** can be understood. Lyn has been investigating this second form of time reversal during his entire life, and this is how he formulated the design in 1996, when he expressed his original principle of hypothesis in dealing with the "future as change" for the science of physical economy. Lyn defined the "intention" of time reversal in physics as follows:

> In order to make clear the apparent paradox, I asked the audience to acknowledge the perplexity, the which this notion of "time-reversal" would pose to the ordinary professional mathematician. I state here, as then: *How might one represent, mathematically, a function in which an event in the future might serve as the apparent cause for an event in the present?* This was, in fact, being considered by the famous Soviet physicist Sakharov, as a formal problem in mathematical physics, during the later years of his life. The issue of the functional role of "time-reversal," is the most important of the fundamental issues confronting mathematical physics today. It is also a key, axiomatic issue in the field of natural law, and, in a related way, important for cleansing theology of certain cultish, intrinsically pagan superstitions, which have no proper place in the teaching of Christianity, Judaism, and Islam. Here, all those issues are implicit; but, it is the decisive role of "time-reversal" in any competent economics teaching, which is the topic explicitly addressed in the following pages. […]

> A dog reaches for a bone; a dog hunts for prey not yet seen, heard, or smelled. How does human reaction to the idea of the future, differ from what an observer might attribute to the "intentions" controlling the dog's action? In short, the difference is, that, except when a man is behaving with the simple-mindedness of a *macho,* materialist, or empiricist, the object of the relevant expression of human intent, is not the apprehension of a sensory object, but, rather, a desired *change* in the *axiomatic* characteristics of some referenced pattern of human behavior. That point may be stated otherwise: *What is desired is not a mere event, nor a mere change in opinion, but, rather, either a change in hypothesis, or theorem.*
>
> The change which distinguishes characteristically human ideas of the future, from the bestial intent which might be expressed by a beast, or in a man's moment of beastliness, is always of the *ontological* quality designated by the connotations of the term *Platonic idea,* rather than mere contemplation of a real, or merely desired object of sense-perception." (Lyndon H. LaRouche, Jr., *The Essential Role of 'Time-Reversal' in Mathematical Economics,* Fidelio, Vol. 5 No 4. Winter 1996.)

Lyn is inviting us to investigate the nature of future-oriented time-reversal as something that pertaining to the domain of epistemological change in axiomatic behavior. How can an axiomatic change be expressed mathematically? It cannot. As Lyn has often indicated mathematics is inadequate for the task. On the other hand, Gödel has only partly answered that question in his new type of cosmological solutions. It is now time to push this question of time-reversal further and submit and open a new inquiry into the matter.

It seems that the first step to take is to always be of the disposition of discovering, that is, to put your mind in the forward bending direction of the future, as opposed to the backward leaning direction of repeating some already established past knowledge. The second step is to forge ahead as if you had already burned your bridges behind you, especially those built with the ropes of mediocrity, and as if you were attempting to erect new bridges ahead and upward that you secure based on the higher plane of expectation with the pure credit of the catenary principle.

So, let's test cosmic radiation with the idea of *simultaneity of eternity* as an expression of time-reversal, for example, and see what comes up. What does a reversible form of physical space-time look like in a galaxy or in the universe as a whole? How you express it will depend on whether you conceive of the universe as a dynamic whole that is not determined by its parts. How does an anti-entropic form of time manifest itself in that sort of universe? Is there some enantiomorphic form to it, as if appearing asymmetrically like in a mirror image? This is the chirality that Pasteur had discovered in wine fermentation of tartaric acids during his studies, and after Jean Baptiste Biot had discovered rotational polarization.

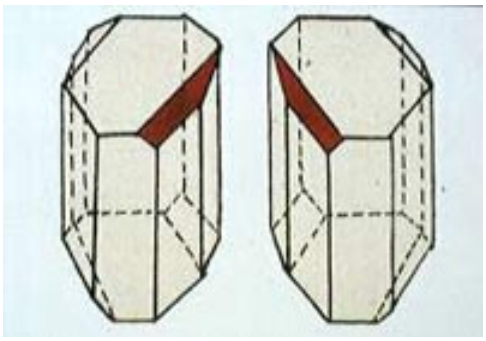


Figure 7. Reversible mirror image of isomorphous crystals.

What Pasteur had discovered and reported in his Doctoral dissertation of 1848, and what crystallographer Gabriel Delafosse had confirmed for him during the same year (as shown in Figure 12), was that certain molecules expressed a unique character of chirality that reflected a growth process by inversion, that is, by reversibility. Again, don't get bogged down in this right and left stuff. Ask yourself: Does that living characteristic also extend to processes of time-reversibility in the universe as a whole, and specifically, in creative mentation? One thing is certain, which is that reversibility is not an adventitious physical process. It represents the footprint of the process of creativity by the simple fact that it has the characteristic of being mutable; that is, self-reflective in the form identified by Lyn as having the character of time-reversal. However, sometimes, there is a conceptual difficulty in understanding this sort of inversion.

When you see an image of right and left-handedness, as in Figures 11 and 12, do not think of left and right, because you will miss the essential point. Think of reversibility, instead. By using the image of a reversible self-reflective process, you are closer to the Noospheric and Biospheric forms of reversibility that dominate the universe as a whole, as an expression of the creative process. For example, if you construct a catenary-tractrix by inversion of tangents, you are constructing it in a manner such that you use the principle of its construction at the same time; that is, in a manner such that *the principle of discovery is also the discovery of principle.* That is the chirality of time-reversal causality. It is that process of reciprocity which is the most important characteristic of Gödel's discovery that he termed the "closed time-like line." The same thing also happens when you act contrary to public opinion, because you cannot kiss someone's ass and look him in the eye at the same time.

CONCLUSION

Thus, in summation, since anti-entropic processes take time and effort, and life is short, it is only fitting that such processes be generated in accordance with principles based on natural law, and that such a natural law be in congruence with the Leibnizian principle of proportionality between reason and power. Therefore, the situation is as if the universe were patiently waiting for the human species to escape the limitations of mathematical singularities, and start to take flight into exploring the solar system. I

emphasize this enduring patience of the universe not because the universe, as such, has the power to understand such singularities, though I would more than welcome the wrath of a modern Clerselier on this account, but, because the intention of humanity is how the Noosphere of the universe understands them. However, the point is that this understanding is futile if it is not balanced with the axiomatic weak power that such singularities provide.

How? This comes about when simultaneity of change in all of mankind is to happiness as enduring changing time is to the simultaneity of eternity of the universe as a totality. Why? Because such a sublime harmony of proportionality of power and understanding between all universal physical principles in the universe is a direct reflection of God's presence in acting to perfect his universe from within. This is what Lyn meant by having God and Heaven inside of the self-perfecting universe, as oppose to outside of it as Aristotle falsely claimed. This means that the highest felicity comes with the recognition that God is both omnipotent and omniscient, and that if some of that were reflected in mankind, the happier the future of the universe would be.

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