From the desk of Pierre Beaudry

ANALYSIS SITUS AND THE PRINCIPLE OF RECIPROCITY

(The case of mathematicians and their abuse of the human mind)

By Pierre Beaudry, October 21, 2012

"If doubt is a measure for the wise, then certainty must be a measure for the fool, because only a closed mind can be certain."

Dehors Debonneheure

Figure1. During the celebration of his Ninetieth Birthday, on September 8, 2012, Irene and Pierre Beaudry demonstrated to Lyndon LaRouche how the principle of reciprocity also applies to an electric field and a magnetic field.

FOREWORD

The domains of epistemology and history got a bonus in 1974 when Swiss philosopher, Jean-Claude Pont, published a little book on the epistemology of mathematics under the title ***La Topologie Algébrique, des origines à Poincaré.*** The bonus is not because the book is so good; it is because it spilled the beans, inadvertently, about what mathematicians have been fighting over during the last 260 years since Euler concocted his Polyhedra Formula.

As Lyn has demonstrated at length, the crisis in science today is caused, to a large degree, by the disorientation of modern mathematics and by the replacement of the principle of mind with the principle of sense certainty. What the title of Pont's book does not say, but implies, is that ***Algebraic Topology*** was meant to be a substitute for the Leibnizian method of ***analysis situs***.

This report intends to restore Leibniz's ***analysis situs*** method to its original purpose as an epistemological form of scientific investigation; that is, whose application must be historically situated and must demonstrate as did Cardinal Gilles Mazarin, Gottfried Leibniz, Ole Roemer, Pierre de Fermat, Louis Poinsot, Carl Gauss, and Bernhard Riemann that the method of ***analysis situs*** was based on the ***universal principle of reciprocity.***

INTRODUCTION: HOW MATHEMATICIANS ATTEMPTED TO BURY *ANALYSIS SITUS*

One cannot look at how much science must change and progress by the end of the Twenty-First Century without having gone through how Nineteenth Century mathematics was a watershed in destroying creativity and how that impacted the domain of physics that was inherited by Max Plank and Albert Einstein at the beginning of the Twentieth Century. That sort of problem requires the revival of the Leibniz epistemological method of ***analysis situs***. The problem that must be solved, during the immediate period ahead, is a mind twister of the greatest importance, because it will require the most concentrated effort of collaboration among young scientists worldwide, focused, in the shortest period of time possible, on the single most important epistemological task in human history: the intention must be to clean up the mess caused by mathematicians during the last two centuries and reinstitute creativity in science. No greater effort will be demanded of the younger generations, yet unborn, than to join the forces of Lyndon LaRouche in this mop-up job if we are to secure the future of mankind in the 22nd Century.

Nineteenth Century mathematics should be viewed as the greatest watershed of wasted minds ever produced in human history, and the question that must be put before the entire youth population of the world at this time is: "What do I have to change within myself in order to secure the future of physical science for the benefit of mankind during the next hundred years? Where are those monsters hiding that were spawned in the murky waters of mathematics during the Nineteenth Century? Which ones are the most important to catch, to neutralize, and to expose ruthlessly in order to restore some sanity in the future of science?"

Among the dark undercurrents of the Mathematical Ocean, there lurks one colossal monster that needs to be brought immediately to the surface, because it has been one of the most insidious and treacherous mathematical creatures ever to be concocted during the last 333 years. I am referring to the creature that has undermined the Leibniz epistemological method of ***analysis situs*** since 1679. The monster's name is ***algebraic topology***.

1. ALGEBRAIC TOPOLOGY *VERSUS ANALYSIS SITUS*: EULER, POINCARÉ

"A proof of validation of a universal principle cannot be made unless it is in the pudding."

Dehors Debonneheure

One of the hidden conflicts at the source of the epistemological crisis in science during the entire course of the second half of the Nineteenth Century, which blew up at the beginning of the Twentieth Century, is located in the mathematical practice of ***algebraic topology***. This crisis, which has left mankind with the mountain of devastated remnants of scientific fakery, was the result of the irreconcilable fight over the role of algebraic magnitudes that Leibniz had made the explicit point of excluding from his geometric method of ***analysis situs*** as early as 1679. The epistemological conflict caused the Leibniz method of ***analysis situs*** to be distorted, sabotaged, and ultimately relegated to the oubliettes after more than 200 years of failed attempts at establishing its viability by a handful of true scientists.

Although Leibniz, Poinsot, Gauss, and Riemann all warned against introducing algebraic magnitudes in the domain of ***analysis situs***, the masses of other mathematicians nevertheless made the case, by implicit public opinion agreement, that algebra was precisely what they required, and, as a result, ***analysis situs*** was abandoned for lack of takers and ***algebraic topology*** took its place. What was kept hidden in that conflict was not a mathematical question, but the epistemological difference between Aristotle and Plato; that is to say, between the two opposite and irreconcilable principles: the principle of sense perception and the principle of mind. The former is based on what is already made from the past, and the latter is based on what is coming to be from the future.

Recently, I was fortunate to stumble upon the 1974 book of the Swiss philosopher, Jean-Claude Pont, entitled ***Topologie Algébrique, des origines à Poincaré*** (Algebraic Topology, from the origins to Poincaré). To my surprise, the Swiss philosopher represented clearly the two opposite lines of battle over which mathematicians fought over 214 years, from 1679 to 1893, but he chose to close his mind to the epistemological difference between the two, because he did not want to make any contrary waves for fear of arousing public opinion against him. Although Pont did not reference this opposition explicitly among the correctly identified mathematicians, he knew that the ***analysis situs genealogy*** that he appended in the conclusion portion of his book revealed the two cited distinctly opposite forces that I will now identify clearly for you.

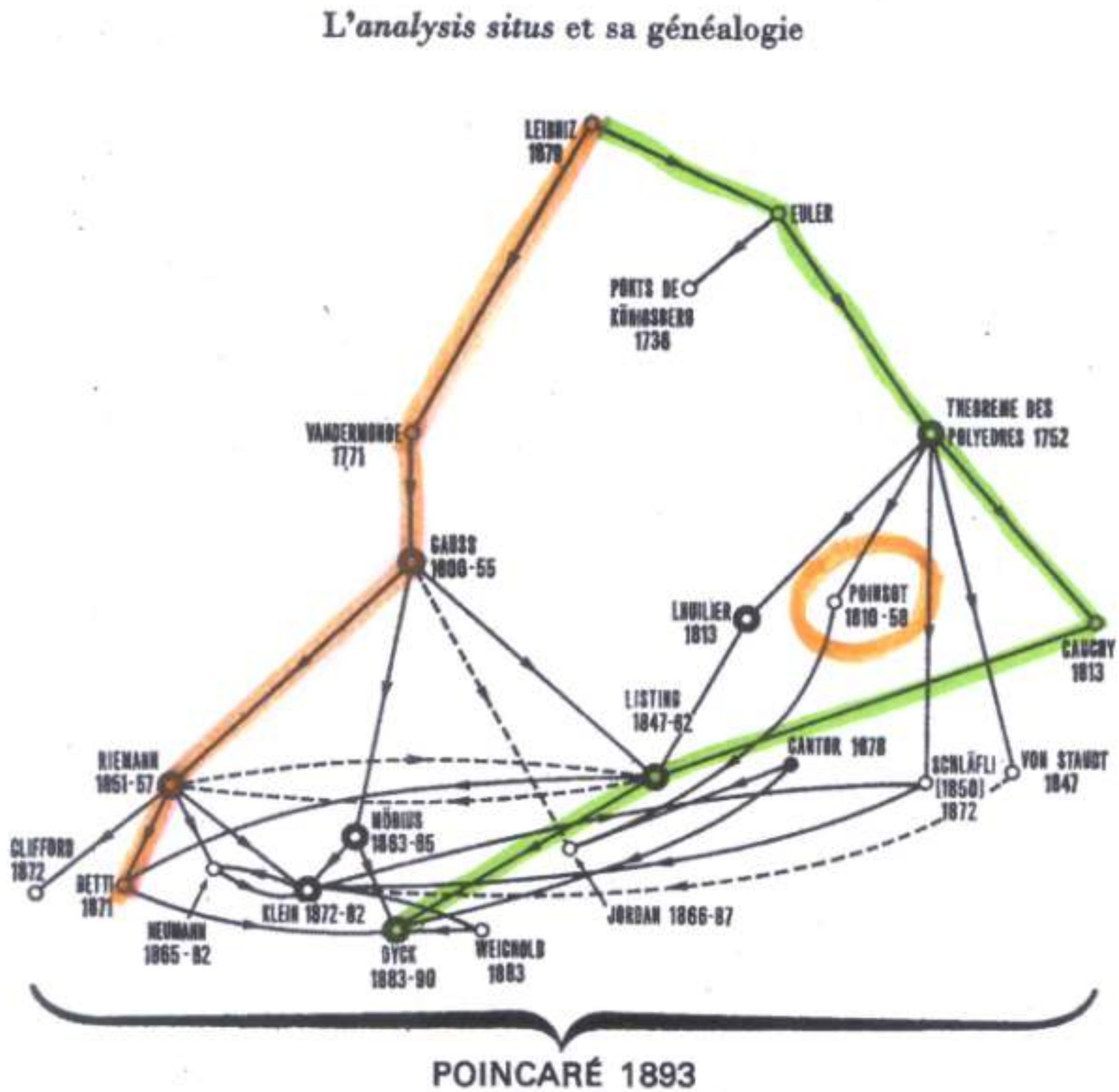


Figure 2. The genealogy of ***analysis situs*** by Jean-Claude Pont, ***Topologie Algébrique, des origines à Poincaré,*** Presses Universitaires de France, 1974, p. 173. I have added color to emphasize the two different and opposed flows: one flow (orange) represents the Platonic-Leibnizian epistemological group flowing through Vandermonde, Gauss, Riemann, Betti, including Poinsot; and the other flow (green)

represents the Aristotelian sense certainty group, flowing through Euler, Cauchy, Listing, Dyck, and to Poincaré who is the founder of modern topology and of chaos theory.

I invite the reader to consider this ***analysis situs genealogy*** as the critical battle ground of a ***Two hundred Year Epistemological War (1679-1893)*** that was waged to destroy the creative powers of the human mind in science by modern mathematicians, and which led modern society to virtually accept committing menticide. This is also, as I will indicate below, the epistemological stuff that World Wars are made of.

Start your search by investigating the matter with a Rabelaisian metaphor to test the quality of two very different waters that you can taste after they have issued from a single Leibnizian source of knowledge. This epistemological test consists in determining the conceptual differences between the two flows. Those two flows represent one of the most important traces in the battle for the mind during the entire history of the human species. Therefore, the test to be made of their differences, in your own mind, is such a crucial experiment that it represents a unique ***analysis situs*** that could not have taken place at any other historical period than during the Nineteenth Century. Therefore, I suggest that the reader start by tasting the green flow, because that is the best way to discover how the orange flow is satisfying. So, let's start with Leonhard Euler and ask yourself: "Why is the topology of Euler wrong for your mind?"

It is well known that the most important contribution to topology Euler made was his formula for polyhedra. There is not a mathematician in the world today who does not know this formula and who has not been deeply influenced by it. So, my question is: "What is wrong with this formula?"

$$V - E + F = 2$$

What does that formula tell you? The formula says that ***what you see is what you get***; that is, when you have a polyhedron, the number of its ***V***ertices minus the number of its ***E***dges plus the number of its ***F***aces is equal to two. The formula is so predictable that no one ever doubted there could have been something wrong with it. It is as if you were to define a house as the number of walls, minus the number of doors, plus the number of windows. So, you might ask: "Why do I consider it to be wrong?" This formula tells you what's in the effect, not what's in the cause. The problem is that the formula merely accounts for what comes before your senses and science is not founded on sense perception. That's what's wrong. In other words, it's not the recipe ingredients that make the pudding; it's the creative process of the cook. So, the question is: "What are you cooking?"

Figure 3. Leonhard Euler. (1707-1783)

Euler does not prove anything with this formula; he merely describes the parts that went into its construction. This formula simply tells you the amounts of ingredients after the pudding has already been baked. Here, the mathematical mind is totally dependent on what sense certainty tells him reality is. The formula deals exclusively with the relationships between perceived parts of a perceived object. It leaves nothing for the mind to discover. Nothing is hidden. Once you have the visual object before your eyes, all you need to do is to count the number of points, lines, and surfaces. That is not a discovery; that is a mere statement of identity. Nevertheless, this formula became the model for all mathematicians to follow, so much so that the entirety of modern mathematics is essentially based on similar recipe notation, as the Euler-Poincaré Formula will later exemplify.

The fundamental question about polyhedra, therefore, is not: "What do they look like?" The question must be: "How are they generated? What's the underlying principle that creates them?" So, what is required for the mind, as opposed to the senses, is to seek the generating principle that created the object, not simply describe the matter of facts of what perception tells you they are after they have already been made.

In order to make the difference between what your eyes see and what your mind discovers, you must see what your mind's eye tells you. For example, in my report on ***Pythagorean Spherics: The Missing Link Between Egypt and Greece***, 21st CENTURY, Summer, 2004, I demonstrated how the generating principle of all polyhedra is located outside of the polyhedra in the domain of Spherics. I demonstrated how the twelve-circle sphere (which appears as the logo of my website) is the generative matrix for the Great Pyramid of Egypt, the Five Platonic Solids, and the Doubling of the Cube. This is not a Poincaré statistical trend analysis leading to a predetermined state of uncertainty or chaos. On the contrary, this paper shows how spherics leads to a higher ordering principle. It tells you that the universe reflects a higher organized form of energy flux-density.

Figure 4.***Analysis situs*** of how the twelve-circle Egyptian sphere generates the dodecahedron, the octahedron and the cube. This is how the proof is in the pudding. (Created by Pierre Beaudry)

This is but one of several applications of ***analysis situs*** in constructive geometry which leads you to a discovery of principle, and which demonstrates where things come from. Unlike topology, your mind is able to choose between functioning from the future as opposed to functioning from the past. Which one do you want? The difference is explosive. It was through a similar process that Poinsot discovered, in the footsteps of Kepler, the principle that generated new stellated polyhedra. (**Figure 5**.) What new polyhedron did Euler generate or discover with his topological accounting?

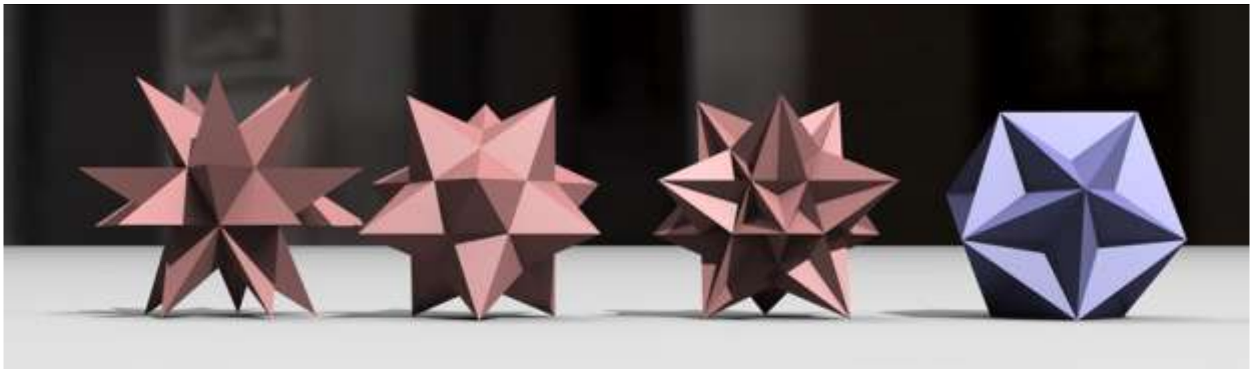


Figure 5. The Kepler-Poinsot Polyhedra showing the axiomatic limit of ***analysis situs*** in the domain of stellated Platonic Solids. (Jim Henderson, Kepler-Poinsot Polyhedra)

Euler and his follower J. B. Listing, deliberately abandoned the Leibnizian idea of ***analysis situs*** and chose instead to follow the dictates of sense certainty, rather than follow the requirements of the creative mind. For instance, Listing rejected the fact that the Leibniz method was meant for solving axiomatic problems as determined by their location; that is to say, problems defined ***within the context of their historical specificity***. Instead, Euler and Listing, after him, retrograded back to the Mesopotamian flatland of Euclid and Aristotle by excluding from the field of geometry the crucial consideration of ***historical physical space-time***. They reestablished a purely ***spatial***, that is, ***a priori*** form of Euclidean geometry, based on arbitrary axioms, postulates, and definitions.

Thus, ***topology*** became the study of the spatial forms that make up a domain of sense perception entities, but without the real physical space-time situation in which these entities exist and change. They are totally cut-off from reality. This was a typical Euclidean-Newtonian procedure of defining sense certainty generalities in total defiance of their implications in the real world, and with total disregard to the human mind. The inevitable result was that the mathematical models became more real to them than reality. This pretentious resonance can be perceived in the intention of Listing when he first invented the term "topology:"

> "Leibniz is the first to have thought, but only to have thought, about his theoretical development. Since that author nothing else has been done in that direction. The field seemed to be too vast, the difficulties too great, and the language too poor. It is Gauss who inspired me to take care of that domain, at the time of my numerous practical studies at the observatory of Gottingen. Leibniz defined that science as the study of the connection and the laws of reciprocal situations of bodies in space, independently of the relations of magnitude which pertained to geometry. He gave it the name of ***analysis situs***. Since, however, geometry cannot decently characterize a science in which the notions of measure and of extension are excluded, as the denomination of geometry of position has already been given to another discipline, and, since, finally, our discipline does not yet exist, I will use the name of topology which appears to be appropriate." (Quoted by Jean Claude Pont, in Op. Cit., p. 42. Translated by the author.)

Consider Listing's reasoning in three steps. First, ***analysis situs*** is just a thought. Second, that thought is of no importance, because it is just a thought that excludes the magnitude of extension from any consideration. And three, geometry of position has already been invented by Carnot, so ***analysis situs*** is no longer required, therefore, topology can make believe it can take its place. Is this science? No. This is a burial ceremony. Indeed, the true purpose of topology was to bury ***analysis situs***, so it can appear to be a new phoenix born, as if by magic, out from its ashes. The truth of the matter, however, is that for the phoenix of ***algebraic topology*** to rise, it did not require to come out of ***analysis situs.*** All it had to do was to follow the pathway of its true unstated model, which is the degenerate form of expressionistic modern art. To paraphrase Euler, it were better to identify Listing's topology with the formula $R - M + R - S = 0$, following the drip painting measure of Jackson Pollock (**Figure 6.**) whose topological formula is obviously:

$$R - M + R - A = 0$$

Figure 6. ***"Convergence"*** (1952) Jackson Pollock.

These formulas are not as mysterious as they seem to be. The Pollock formula merely says: ***R***eality – ***M***ind + ***R***etina – ***A***rt = ***0.*** You can easily guess what the Listing formula means. This is the topological formula for all of so-called "modern art;" which was recently confirmed by mathemagician, Richard Taylor, who demonstrated a variation of the same idea by attempting to show that Pollock's drip paintings were hand-made fractals demonstrating the mathematical mastery of chaotic motion: so much for modern art and ***algebraic topology***.

Just as abstract painting and atonal music began to poison the domain of artistic composition near the end of the nineteenth century, so mathematics led modern science to a mental suicide with an overdose of visual perception effects, and their imaginary offshoots. The resulting transfigurations of reality can more than adequately be expressed by the expressionist floor decoration experiments of Jackson Pollock. However, no one dared say this stuff was stupid, because that would not have been well received by public opinion. However, the truth of the matter is that this amazing symbiosis between so-called science and so-called art is what led the modern world into World War One. This state of mind was confirmed by Pont, himself, when he endorsed the fallacy of composition expressed by art historian J. E. Muller who wrote:

> "Deformation has become one of the distinctive traits of modern art, in the domain of sculpture as well as in painting.
>
> "[…] Since the art of the Renaissance, which was concerned with defining man by what differentiates him from every other creature, applied itself to limit man in his most distinctive physical particularities, modern art, in deforming them, forces him out of his limitations and discovers in him affinities which exist outside of him…Thus, to the art dominated with the concern of identity follows the art which puts the accent on the analogies." (Quoted from J. E. Miller, ***L'art moderne, ses particularités et leur explication***, Livre de Poche, Paris, 1963, p.51 and 72.)

Pont seized upon the fallacy of this misplaced freedom from limitations by stating: "Let us now demonstrate that the passage of geometry to topology, or more generally the passing of traditional mathematics to modern mathematics is analogous to what was just described; this is so true that the preceding quotes might just as well have been written to characterize it." (J. C. Pont, Op. Cit., p. 167.) The point is that Pont was serious.

The only problem, here, is that, as result of its relationship to sense perception, the limit considered is the wrong limit. It is not the physical limit of sense perception that the Renaissance was dealing with, at least not Piero Della Francesca, Leonardo, and Raphael. Neither Pont nor Muller understood that the limitation the Renaissance dealt with was mental. And the question that the Renaissance artist posed was precisely the question of how to go beyond the mental limitations of man treated as an animal, that is to say, how to create an artistic composition as amatterofmind. And the answer is to be found, as I have demonstrated numerous times, in the ironies of classical artistic composition.

It is the art of irony which is the characteristic of classical artistic composition, not representations of sense perception. To get a more complete sense of how this is displayed epistemologically in classical music, I recommend you take a peek at my report on ***The Truth about Beethoven's so-called "Moonlight Sonata,"*** and have a look at the treatment given by David Shavin to the Leibniz method of ***analysis situs*** in his ***The Strategic Significance of J. S. Bach's A Musical Offering***. Shavin also has an excellent section on the shortcomings of Euler with respect to the Leibniz Academy, notably as it pertains to the domain of electricity. And, this leads us to another problem which is the proper subject of this report, the question of reciprocity.

One of the greatest mental damages that modern mathematicians and modern artists have caused to society is to have eliminated the principle of reciprocity from the domain of science and art altogether; that is, by rejecting the significance of the impact that science and art have on mankind, and conversely by ignoring the impact human change has on the universe as a whole. When you ignore that, all you are left with is romanticism and war. This might not appear to be important, but it is indeed fundamental. Modern art and modern mathematics both destroy the reciprocal connection between mankind and the real world and lead to war. By idealizing its objects of sense perception and by speculating on points, lines, and surfaces, mathematicians have decomposed reality in the same infinitesimal particles that modern abstract artists have done with their expressionistic fantasies and are left with impressions of the fields of Verdun. In the realm of total freedom, fantasy is king because it has replaced reality and excluded reciprocity. As Pont wrote with glee, mathematicians find more in their analytical expressions than what exists in the real world:

> "Thus, it is by idealizing the objects submitted to our daily observation that mathematicians have taken hold of the fundamental geometrical objects: points, lines, surfaces; that they believed, after a renewed effort of abstraction, they could replace them with analytical expressions; however, the latter have proven to be richer than the reality they were suppose to cover up; in other words, if for each line or surface, for which there exists a corresponding image in the outside world, there is a corresponding analytical expression, the reciprocal is not true." (Jean-Claude Pont, Op. Cit., p. 167.)

The word "cover up" (recouvrir) was not accidentally chosen by Pont. He used the term as if sense perception had been invented to capture mathematicians into the trap of making believe they are dealing with the truth of their own concoctions. In reality, what modern mathematicians are doing under the name of science is the same cover up that bankers carry out with financial derivatives under the name of economics. It is the same degenerative process that produces financial derivatives created out of thin air. And for the same reason mathematicians would not accept to come under anyone's critical scrutiny for transparency anymore than Wall Street traders would.

The error is not in the object that mathematicians have concocted, it is in making believe that man had entered into a new era of freedom where there were no longer any limits to the freedom of expression. This is how creativity has been destroyed through modern art and modern mathematics by reducing the human imagination to anybody's idea of generating effects of sense certainty instead of searching for universal principles in connection with the progress of the real world.

To put a more specific bracket around this destructive operation, the historical axiomatic change that took place during that period of European history in the domain of mathematics can be precisely identified as having taken place between the 1799 demonstration by Gauss of the ***Fundamental Theorem of Algebra*** and the 1895 publication of the Henri Poincaré mémoir on ***Analysis Situs***, in Journal de l'école polytechnique. After almost a century of subverting the domain of physical science, the results inevitably set the stage for something very dramatic to take place in Europe at that time.

At the end of the Nineteenth Century, it became clear that ***algebraic topology*** had turned out to be nothing else but the equivalent of a new set of clothes for the mathematicians who had abandoned the reality of physics. Mathematical imperialism was born. But, there was much more happening in the strategic situation of Europe than meets the eye at that time. As Lyn emphasized in several writings, the world economic situation was in shambles, and the Europeans were the first to suffer from the demise of Bismarck in 1890 and the assassination of French President Sadi Carnot in 1894. Thus at that time, a new form of imperialism had begun to take over Europe, whose initial phase became known as "Poincarism."

My question is: Was it simply coincidence that while mathematician Henri Poincaré was committing menticide by burying the Leibnizian method of ***analysis situs***, his cousin, Raymond Poincaré, President of France, was committing genocide by adopting the British policy of starting both World War I and World War II? The interrelationship between those two historically specific situations must be viewed as complementary in affecting the global paradigm shift that took place in the world strategic situation and in science at the beginning of the Twentieth Century. In the mean time, an appreciation of the ***analysis situs*** of the Peace of Westphalia might help us better understand this puzzling question.

2- RECIPROCITY, ANALYSIS SITUS, AND THE PEACE OF WESTPHALIA: MAZARIN

What does ***analysis situs*** have to do with the principle of the Peace of Westphalia? This question may seem bizarre and disconnected at first, but it should become more congruent in your mind before this section of our investigation is over. Think of the idea of the Riemannian connectivity in the sense that Lyn has been using in his method of economic forecasting. Such connectivity, however, cannot be made by investigating Abelian integrals relative to some mathematical hypercurvature. That would be a waste of time. The way to proceed is through the connectivity of the paradoxes of the Thirty Years War, and the connection is made through the moral principle of the ***advantage of the other***; that is, through the process by means of which natural law applies ***analysis situs*** as an expression of an enfolding and unfolding reality. That's the state of our current situation. Now, how do you do an ***analysis situs*** of the Peace of Westphalia?

Take the primary paradoxes involving the German and the French nation's armies as closed entities during the ***Thirty Years War***, and look at each of them as connected through the same common anomalies, the same common paradoxical singularities, and the same axiomatic powers to change. Think of them as opposites, but reciprocals of each other, and ask yourself: "How did Cardinal Gilles Mazarin succeed in creating an overriding force that brought all of the conflicting parties together into a single process of negotiation after half of the male population of Europe had been killed over a period of thirty years of vengeance warfare? How did he use the Dirichlet Principle whereby each of the smallest parts had the power to affect the whole?" There are two important factors, here.

Figure 7. Cardinal Gilles Mazarin (1602-1661)

1- First, let's identify the central anomalies, or paradoxes, that defined their strategic situations.

- The German paradox can be identified as the ***Elector of Brandenburg Paradox*** through which Frederick William had formulated his own personal situation when he wrote to Mazarin: ***"I agree with your principle of the advantage of the other, but, if I apply it to myself, I will be killed."***
- On the other hand, the French paradox can be identified as the ***Mazarin paradox*** which said: ***"France cannot win the war against the Habsburg Empire unless the German Electors join the French forces at the negotiating table, but this cannot be done unless France sacrifices her own self-interest for the benefit and the advantage of the Protestants."***

These paradoxes represented two typical closed historically defined situations like two manifolds which have common borders, but which need to be integrated into a higher manifold that would change the nature of those borders forever. Think of them as two different domains of curved motions having only single-connectedness within their respective domains, like simple circular action, but which require double-connectedness if they are to live in peace with one another. In other words, each of those two situations must be considered not as singly-connected, but as doubly-connected, in a manner that Riemann implied in his habilitation dissertation; that is, in such a manner that every element of one sub-manifold can be transported into the other sub-manifold with reciprocity. Similarly, the entire question of the Peace of Westphalia was to determine how the German and the French peoples, among others, could treat each other as reciprocals, as historical memory remembers them under Charlemagne. Today, however, the irony is that, with the banking system failure of the Euro currency system and the Maastricht dependency, Europe will be destroyed in the short term unless every European nation reverts back to a new form of the Peace of Westphalia.

The Treaty of Westphalia signed by the Holy Roman Emperor of Austria and the King of France, and their respective allies, established that "this Peace and Amity be observed and cultivated with such a Sincerity and Zeal, that each Party shall ***endeavor to produce the Benefit, Honor and Advantage of the other;*** (emphasis added) … That there shall be on all sides ***a perpetual Oblivion, Amnesty, or Pardon of all that has been committed since the beginning of these troubles, …***(emphasis added)" (Treaty of Westphalia)

The kings of France had been forced to adopt this ***agapic*** ecumenical advice of Cardinal Gilles Mazarin (1602-1661), ally of Pope Urban VIII, former minister of Anne of Austria, and Prime Minister of France, and they were to become, regardless of the ***folie des grandeurs*** of Louis XIV and of successive insane Austrian Emperors, the guarantors and guardians of a durable Peace for all of Europe based on "***the Benefit, Honor, and Advantage of the other***."

The benefit was for the German Protestants, and the only way to guarantee it was for France to eliminate the difference between the Germans and the Habsburg Empire. The strategic diplomacy of France was also to keep each and all of the different entities on the alert and prevent them from attempting to extend any enlargements among them, as well as preventing any tendency of a unified power of the Empire from developing among them and anticipate anything else that might endanger the tranquility of Europe, and universal peace.

Nothing but an explicit return to the principle of the ***advantage of the other***, exemplified by the American Glass Steagall legislation, can open the door to solving today's axiomatic historical moment. The oligarchical principle of ***taking advantage of the other*** must simply and ruthlessly be replaced by the Leibnizian form of justice he called ***Charity of the Wise***. Here is an illustration of how the ***Charity of the Wise*** works from the standpoint of a reciprocal congruence of ***analysis situs***.

2- Secondly, let's identify the idea of reciprocity simply as ***you doing to others as you would have others do to you.*** Simply imagine that one of those two triangles is French and the other one is German. In that sense, reciprocity is not seeking similarity between different people; it is seeking to eliminate the apparent differences between similar people. Take the simple Leibniz pedagogical device of establishing a relationship of congruence between two similar triangles. The triangles appear to be different merely because they cannot be mapped directly one onto the other, yet they are reciprocals. How does that work? In reality you can change that situation by developing a congruence of reciprocity such that ABC ≡ DEF.

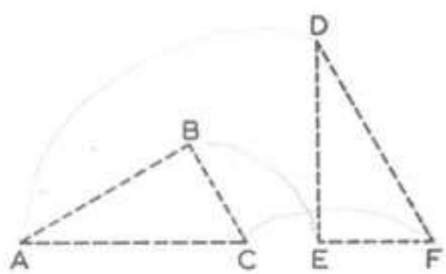


Figure 8. Congruent triangles. (Leibniz)

The only way these two triangles can become congruent is by operating an inversion of one triangle onto the other. You can do that by inverting the "mirror image" of triangle ABC in your mind and rotating it into triangle DEF. In his 1679 letter to Huygens, Leibniz showed how this case of congruence could simply be achieved by simultaneously rotating all of the points. "… one can at the same time Place A upon D, B upon E, and C upon F without the situation of the three points ABC being changed in relation to each other or that of the three points DEF to each other, assuming in this that the first three points are connected by rigid lines (whether straight or curved does not matter) and the other three likewise." (Gottfried Leibniz, ***Philosophical Papers and Letters***, Kluwer Academic Publishers, 1989, p. 251.) The congruence between the two triangles cannot be achieved without this inversion. The interesting part, however, is that the inversion requires a notion of limit without magnitude. This is where mathematicians will tend to become all confused. How can you have one without the other?

From the standpoint of mathematics, this must be one of the most mysterious aspects of epistemology, because the mind of the mathematician is unable to separate the concept of limit from the concept of magnitude, without the concept of limit being defined as a magnitude. Only the man, not the mathematician, is capable of accounting for a high density of singularities during an axiomatic crisis. This was, as I have noted elsewhere, the Achilles heel of Cauchy with respect to the Leibniz calculus, because for Cauchy the concept of limit always required representing something that was bounded by sense perception, and not by any conceptual measure. These are the two contradictory representations of limit that are in conflict here, and which must be resolved on epistemological grounds if science is to move forward again.

On the one hand, the limit of the empiricist requires a sense perception boundary condition, while the boundary condition of the idealist requires a conceptual gestalt projected from a higher infinite. This was precisely the problem that Plank and Koehler discussed as being necessary in the domain of ***quanta***. The solution to the ***quanta*** problem is found in gestalt theory, not in chaos theory. This is where things stand today, and unless this is recognized, there is very little hope for science in the future.

The trap that mathematicians fall into is that everything extends indefinitely into the small or into the large, and this is why they fall prey to bad infinities such as fractals. Take a look at the map of Germany near the end of the ***Thirty Years War***, and all you will see is fractals. While, in the real world, physical space-time events always extend to the point of reaching a definite paradoxical limitation, the apparent bad infinity of the situation will require a creative solution coming from a higher manifold, as Riemann demonstrated. The epistemological function of limit, therefore, does not reside in the fact that it provides a boundary of the system against foreign magnitudes, as it does in mathematics; it expresses exactly the opposite. It expresses the condition of a total breakdown of the previous mode of existence of that system, because the system of its existence no longer functions and is filled with holes, otherwise known as a high density of singularities. As a result, the more you try to save the old system, the more you accelerate its demise. There is no choice but to change the old system as you become increasingly confronted by the paradoxes that come from the existence of a new universal principle.

The mathematical notion of a limit is quite different from this mode of "existential crisis," because the mathematician uses the concept of limit as a protective shield against the necessity of making the required epistemological leap into the future. Mathematicians usually get away with simply saying pragmatically: "I will pass over to the limit and crush anyone who tries to stop me; in order not to have to deal with the axiomatic difficulty that a lawful change requires of me." This is when fallacies of composition come in to replace the truth of the matter of mind in military strategy. It should be easy to see that the ignorance of such lack of rigor can no longer be tolerated in mathematics or in science generally.

As the Leibniz example of the congruent triangles shows (**Figure 10**.), the function of inversion must be restored to science, and mathematical fallacies of composition are not acceptable in the real world. The point that Leibniz made is that the ***lacuna*** cannot be expressed algebraically. It can only be established by the fact that the change can take place without modifying the figures in any way only by introducing the new dimensionality of a new principle. This is the simplest form of ***analysis situs of change*** that one would have to deal with under the unfolding form of a changing strategic situation, without changing the identity of the entities involved under the same constant governing principle. That is the sort of mental twist that Mazarin required of his French Plenipotentiaries in order to achieve a lasting peace among European nations, when the Peace of Westphalia was signed in 1648.

The method of Mazarin called for solving a three-mind problem, in which the third mind-C must discover ways of eliminating the differences between mind-A and mind-B. In other words, France was required to eliminate the difference between Germany and Austria. That was the formula for the ***analysis situs*** of the Peace of Westphalia, the same as the triply-connected ***analysis situs*** of the Archytas process for doubling the cube. However, strategically and historically speaking, the method failed after the death of Mazarin.

When King Louis XIV of France came to his majority, he began to undo everything that Mazarin had done for the peace of Europe. The French King's mind functioned like a singly-connected manifold and he was unable to rise above his egotistic aspiration of grandeur. Consequently, Spain refused to sign the Peace of Westphalia and continued its war against France for another eleven years, while Austria also continued to support Spain against France. How did Louis XIV respond? He insulted the Habsburg Emperor, Leopold I, his cousin, and swindled the King of Spain, Philip IV, into giving him his daughter in marriage, the Infante Maria-Theresa who became his wife in 1659.

In 1660, the northern states of Europe were once again at war. This new surge of fractalization included Poland, Denmark, and the Brandenburg who were in league against Sweden, an ally of France. Regular relations between France and Austria only started in 1664, but this rapprochement merely reflected a new form of rivalry between the King and the Emperor. Louis XIV believed he could maintain his persona by bullying and insulting the Emperor, and, in 1668, he invaded the Lower Countries of Flanders and Hainaut in an attempt to gain all of the territories west of the Rhine River. Moreover, in 1678, the French King took Franche-Comte and fourteen more towns of the Lower-Countries. Finally, in 1685, Louis XIV made the biggest mistake of his reign: he signed the Revocation of the Edict of Nantes, which began a new witch-hunt against the French Protestants and triggered a new war of religion: the beautiful edifice of the Peace of Westphalia was in shambles. However, although Louis XIV had destroyed the practical means to maintain the Peace of Westphalia, the spirit of that peace could not die.

As a result of Louis XIV's folly, which became rightly known as "la folie des grandeur" (The Folly of Grandiose Ambitions) the near totality of French manufacturing and commercial capabilities left France with the French Protestant families who fled to Germany for safety. After fifty years of Louis XIV's mismanagement, the German Principalities had no choice but to ally themselves again with the Habsburg Empire, and both German Catholics and Protestants joined with Austria to wage a Nine Years War (1688-1697) against France. Had the King of France been an agent of influence working for the benefit of the Habsburg Empire, he could not have done a better job. The reign of Louis XIV was the greatest aberration in French history that opened the door to the Venetians taking over Great Britain with the Glorious Revolution of William of Orange in 1688.

Thus, the Treaty of Westphalia has played a crucial strategic political and ecumenical role of peace and security for all of the nations of the world, during all this time, "by rivalry or by alliance." As did the American Monroe Doctrine later, the Westphalia principle stood as a great beacon of hope and security on the dangerous sea of world affairs, but the imperialist oligarchical principle of population control had taken the upper hand one more time. The only way this ***principle of political reciprocity*** can be restored again today is by reestablishing the ***three-mind-problem-solving-method*** again, regardless of the mounting dangers of a new hundred-year religious war newly formed by the new Anglo-Saudi Empire of war and domination.

3- RECIPROCITY AND THE GEOMETRY OF MORALITY: LEIBNIZ, ROEMER, FERMAT

In a universe of minds understood as monads, the idea of causality does not apply as in physical processes, because there is a sovereignty principle attached to the nature of free will. In other words, a monad cannot be caused to change from any external agency by sheer force of intervention. As Leibniz demonstrated, a monad can only change itself, willfully, and this can only be done through the principle of reciprocity based on justice or ***agape***. Why? Because, as Leibniz showed in his paper on FELICITY, only reciprocity can bring harmony among the monads. And, the reciprocity principle linking monads is the moral principle of nature that is determined by preestablished harmony; that is, ***by the harmony of treating others as one would wish to be treated***. Moreover, preestablished harmony is also based on the fact that every monad in the universe is a teleological reflection of the universe as a whole. In other words, such universal interactions among monads are not mechanical but intentional and purposeful in character. Several consequences necessarily result from this shocking idea of sufficient reason. (See ***Monadology***)

First of all, reciprocity is both a fundamental principle of action in the universe and represents the primary moral principle of direction of human conduct within society. It is in this way that man becomes also known by the universe. The principle is expressed through the power of the ***zeitgeis***t, or the power of the « collective mind » principle, to which every man, woman, and child are tributaries. It is only from such a social principle that a lasting international peace can be derived. This is what made the principle of the Peace of Westphalia so enduring until today; whether alliances existed or not. If the principle of reciprocity were to disappear, extinction of society would be the inevitable result.

Figure 9. Gottfried Leibniz (1646-1716)

This means that the principle of sovereignty (identity) is what must govern relationships among monads, and reciprocity must govern the relationships of sovereign nations. Leibniz identified such a relationship as the underlying principle of sufficient reason. Indeed, for Leibniz everything must have a reason for being what it is and nothing else, because it could not otherwise exist. Therefore, the reciprocal of the principle of sovereignty is that everything must have a reason for being what it is, including the failure of the sixty-eighthers who brought about the Maastricht system to Europe with their axiomatic scream of identity: "I DON'T NEED A REASON!"

However, the interesting question is: why does reciprocating require an inversion? Could it be because this is how the mind works and how creativity in the physical universe organizes itself, and therefore, it cannot take place in any other way than by reflecting universal reason? Why else would it be, then, that for Leibniz, the reciprocal of the principle of identify is the principle of sufficient reason? How did Leibniz manage to link up identity with sufficient reason? Is it because there is no other option, because reciprocity must exist of necessity otherwise nothing would exist as opposed to something? This seems to be the most difficult question for a liberal mind to answer. Why must something reciprocal exist rather than not exist? Why not let everything possible exist? Why do we have to have reciprocity? For example, why is the speed of light a crucial experiment for determining the limit of sense perception? Is there not an option? No. The reason is not obvious, but if you think about it, you will find that reciprocity of the speed of light is located in the domain of epistemology, because the speed of light is the physical reciprocal of the simultaneity of eternity of the human mind.

Another reason for sufficient reason is that the human mind is also known by the universe. '***To know as you are also known***" said Saint Paul in ***Corinthian 1, 13*** is the real intention of the universe, its purpose. The implication is that the mind of the universe existed in an incomplete form before the existence of man, as the reciprocal of the individual human mind. And the function of man, therefore, is to realize that intention and bring it to its end. This is the reason why Lyn proposed that we take ***"The View of Man From The Side Of The Universe Itself:"***

> "The leading objective of this approach, and its challenge, is to see the universe, Earth within, and our selves on Earth, from the side of that view, virtually by the universe "himself," now viewing man's existence within man's living body, experiencing, thus, the noëtic expressions of the objects called sense-perceptions, which are to become the subject to be understood. We must build the pathway of escape from man's imprisonment in the character of the customary scientific achievements, of continuing to be the virtual "stumblebums of the Universe," stumbling across merely scented-out realities which we could never really understand."(Lyndon LaRouche, THE SECOND FRIDAY BEGINS, LaRouchePAC, Sunday, October 7, 2912.)

Consider one last consequence for sufficient reason. Take, for example, the following Riemannian reciprocity ***in situ.*** Reciprocity was the ***sine qua non*** condition that Riemann had established in his ***Theory of Abelian Functions*** for demonstrating how to transmit ideas from one mind to another mind through a rational means of communicating ideas. Riemann wrote:

> "The equation F (n, m/s, z) = 0 can therefore be transformed into F (n^1 m^1/s^1, z^1) = 0, and ***vice versa***, by the use of a rational transformation. The domains of the magnitudes (s, z) and (s^1, z^1) have therefore the same degree of connectedness, because at each point of the one corresponds a ***unique*** point of the other[…] In this manner, any equation leads evidently to a class of systems of algebraic functions with the same branching which, by the introduction of a function of the system as an independent variable, are transformable into each other, and this in such a way that all the equations of ***one*** class lead to the same class of systems of algebraic functions; and reciprocally (§XI), any class of such systems leads to ***one*** class of equations." (Bernhard Riemann, ***Theory of Abelian Functions, Crelle's Journal***, V. 54, 1857.)

The point that Riemann in making is that this connectivity does not apply only to physical objects, but also to the objects of the mind (***Geistesmassen***). The transformation takes place between one mind and another and what are transmitted from one mind to another are universal principles. The process does not relate to the domain of magnitudes between (s, z) and (s^1, z^1), because universal principles have no such magnitudes. The emphasis must be put on the reciprocity of minds within their historical specificity, and with regard to their level of connectivity. This reciprocity is reflected in the Chinese word ***Ren*** 仁 which means "two-minded man." Eliminate the necessity of magnitude, and you eliminate the necessity of perception between two minds. This doubly-connected mental relationship, as Riemann emphasized a second time a few lines below, must be treated in a manner that is "completely abstracted from any metric relationships." At the end of his Habilitation Dissertation, Riemann called for mathematicians to abandon pure mathematics, and go into physics. Every time Riemann indicated the need to go to a higher n + 1 manifold, or I would say, ***Ren + 1***, or three-mindedness, he was referring to the generalized Leibniz form of ***analysis situs***, because his intention was always to save minds from mathematical deduction by putting them into a ***Monadology*** form of combination. But, how many mathematicians did actually make that leap to understand that?

Now, apply this form of reciprocity of ***Ren +1***, as Riemann intended, to the creative human mind as opposed to objects of sense perception magnitudes. What do you have? You have an epistemological prerequisite for a dialogue of civilization which is very similar to the one that Leibniz had established in his ***Monadology*** or when he developed his characteristic for binary numbers as a rediscovery of the characters of change in ***I Ching***. Again, this is what Leibniz meant when he called for eliminating all algebraic magnitudes from ***analysis situs***; that is, when he originally discussed this new subject with Huygens in 1679. Let's turn to this crucial letter and examine it in some details. Leibniz wrote:

> …"But in spite of the progress which I have made in these matters, I am still not satisfied with algebra, because it does not give the shortest methods or the most beautiful constructions in geometry. This is why I believe that, so far as geometry is concerned, we need still another analysis which is distinctly geometrical or linear and which will express ***situation*** [***situs***] directly as algebra expresses ***magnitude*** directly. (Gottfried Wilhelm Leibniz, ***Philosophical Papers and Letters***, Kluwer Academic Publishers, 1989, p. 249.)

This should be enough to make the point that algebra must be excluded from ***analysis situs***. Algebra and geometry are two different domains. In fact, Leibniz's primary objection with algebra was that it could not express motion, change, and transformation of the mental creative processes. Therefore, the new characteristic he was looking for had to have the ability to deal with situation, motion, and transformation of minds, and these conditions had to be congruent not only with the creative process of the physical universe as a whole, but also with how the human mind works when confronted by an axiomatic change. People are experiencing a similar situation in the present world banking breakdown crisis. In the same letter to Huygens, Leibniz wrote:

> "I have discovered elements of a new characteristic which is entirely different from algebra and which will have great advantages in representing to the mind, exactly and in a way faithful to its nature, even without figures, everything which depends on sense perception. Algebra is the characteristic for undetermined numbers or magnitudes only, but it does not express situation, angle, and motion directly. Hence it is often difficult to analyze the properties of a figure by calculation, and still more difficult to find very convenient geometrical demonstrations and constructions, even when the algebraic calculation is completed. But this new characteristic which follows the visual figures, cannot fail to give the solution, the construction, and the geometric demonstration all at the same time, and in a natural way and in one analysis,

that is, through determined procedure. Algebra is compelled to presuppose the elements of geometry, this characteristic, instead, carries the analysis through to its end.

"[…] Finally, I have no hope that we can get very far in physics until we have found some such method of abridgment to lighten its burden of imagination. For example, we see what a series of geometrical reasoning merely to explain the rainbow, one of the simplest effects of nature; so we can infer what a chain of conclusions would be necessary to penetrate into the inner nature of complex effects whose structure is so subtle that the microscope, which can reveal more than the hundredth-thousand part, does not explain it enough to help us much. Yet, there would be some hope of achieving this goal, at least in part, if this truly geometrical analysis were established. " (Leibniz, ***Philosophical Papers and Letters***, p. 250.)

What Leibniz developed, here, is the requirement of a geometry that is ***performatively generative***; that is, a geometry which expresses the intention, and accomplishes the action of that intention within the same process. In other words, he is looking for a form of constructive geometry which will not be reduced to algebraic calculation, but which will be able to account for specific situations as they unfold, solve them ***in situ*** as they develop in an historically specific fashion, and, thus, realize a situation analysis somewhat like a musical composition which displays the intention and the application of that intention all at once, like the preludes and fugues of Bach. Nothing, in such a situation, must be presupposed except what is coming from the future; everything must be a carry-through of the intention. Leibniz is even more emphatic about this in the second part of his study:

"What is commonly known as ***mathematical analysis*** is analysis of ***magnitude***, not of ***situation***, and as such, it pertains directly and immediately to arithmetic but is applicable to geometry only in an indirect sense. The result is that many things easily become clear through a consideration of situation, which the algebraic calculus shows only with greater difficulty. To reduce geometric problems to algebra, i. e., to reduce problems determined by figures to equations, is often a rather prolonged affair, and further complications and difficulties are necessary to return from the equation to the construction, from algebra back to geometry. Often, too, the constructions produced in this way are not entirely appropriate, unless we are lucky enough to stumble upon unforeseen postulates and assumptions." (Leibniz, ***Philosophical Papers and Letters***, Cit., p. 254)

Thus, it is clear that what Leibniz is seeking is something that algebra cannot handle and cannot generate; something that algebraic topologists could not even understand, because of their dependency on sense certainty. The stumbling block, as Leibniz keeps insisting, is algebra. What Leibniz was looking for is a way to go around the algebraic mentality, and access an analysis of situation which could express the process of creativity, as the creative process of mind unfolds in a living historical situation. This is a great task that Leibniz called for. This is not a search for detail refinements in Euclidean space, because even the most advanced microscope or telescope will not give it to you. This is a search for the geometry of how the mind must solve problems. How does the mind work; how does it operate; how does it construct ideas; how does it make discoveries in a given living situation? How does it orient itself and hitch itself onto the future? You can go into excruciating details about how physical objects of sense perception are constructed, but, if you do not investigate your mind, you are wasting your time.

Next, take the case of the discovery of the speed of light by Ole Roemer as a most adequate example of investigating how the mind works without algebra in astronomical ***analysis situs***. In 1676, when Danish astronomer Ole Roemer studied the apparent duration of the eclipse of a moon of Jupiter, Io, he did not discover the time-lapse of an object is space; he actually discovered the physical limit of sense perception observation with respect to the speed of light. Roemer discovered the limit of human observation by the fact that light took about 22 minutes to travel a distance equal to the diameter of the Earth's orbit around the Sun, which was about 220,000 kilometers per second, roughly 25% off the true value of 300,000 kilometers per seconds.

That discrepancy was later discovered to be due to a faulty calculation of the distance of Jupiter from the Sun, but was not due to any defect in his method of discovery. However, the true point of controversy that arose immediately at the time of Roemer's discovery was announced did not have anything to do with the magnitude of the actual speed of light, but with the method Roemer used to demonstrate that light travelled at a constant speed, while the Cartesian belief was that light travelled instantaneously. That was the crucial fallacy to eliminate from the scientific human mind. The constant speed of light was relative to the situation of the observer. Thus, Roemer discovered a means of improving the mind by eliminating the fallacy of composition of absolute instantaneity. That's the essence of his discovery.

Figure 10. Ole Roemer. (1644-1710)

In this manner, Roemer had discovered a unique way of dealing with physical-space-time relative to mind; that is to consider a new way to relate past, present, and future, to astronomical changes in the universe. What the Roemer discovery shattered was the widespread belief that one could rely on measuring things based on sense certainty, because everything you saw was paradoxically not where you thought they were at the moment that you made your observation. From that moment on, the measure of any motion in the universe was capable of being established as a conception and not as a perception. This is when the era of the speed of light as a higher manifold of existence in the universe truly begins in history. And, what the discovery demonstrated, foremost, was that light did not travel like everything else you saw, and that everything else you saw, was measurable on the background of that finite magnitude.

The irony, then, is that when you consider the speed of light with respect to mind, it always comes from the future as a means of changing the past. At the moment of your observation of the heavens, all celestial objects no longer exist where you see them, and you are located in their future. For example, light takes 1.255 seconds to travel from the Moon to the Earth, and it takes 8 minutes and 19 seconds for sunlight to reach the Earth from the surface of the Sun. If you also take into account the fact that the Earth and other objects are moving through space, your perception will also be off by that degree. In other words, nothing that you are looking at in the heavens is actually where you see it at the time when you see it, because you are ahead of it. You have to infer that this is where you think they are plus a correction. Without this inference from the future, you cannot properly account for any degree of change. That is a crucial part of the situation that must be accounted for in developing the ***analysis situs*** if you wish to know where any object of the heavens will turn out to be in the next moment.

Therefore, when you account for the speed of light, you must also be conscious that you are observing the future of the past, and therefore, the greater the distance you are observing, the greater is the future of that past expanding. Consider, for instance, that the images of galaxies viewed today by the Hubble Ultra Deep Field imaging telescope actually renders the state of those galaxies as they used to appear 13 billion years ago. In other words, there is no way to know where such galaxies might be today, or even to determine if they still exist. You are observing from 13 billion years into their future. What happens to reciprocity in this case?

This means that while we live within a limiting-measure of physical-space-time, which is the speed of light, and that requires that we go beyond that axiomatic limitation if we are to understand what those galaxies are going to be like tomorrow, we are also beyond that limit in the simultaneity of eternity with long time past. Thus, our knowledge must always be inferential, with respect to physical-space-time, given that the human mind can creatively discover as present what we will make of the future of our own universe through our ability to change the past.

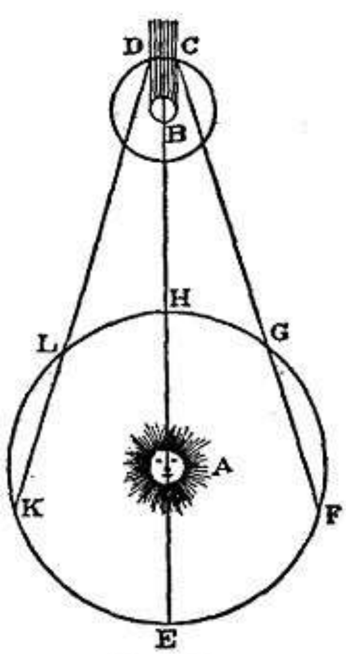


Figure 11. Reproduction of the original drawing of Roemer which depicts the differences in the constant speed of light between the time when the moon Io is eclipsed from D to C behind Jupiter, and the motion of the Earth moving toward Jupiter from F to G, and away from Jupiter from L to K. If those two latter space-time differences are constantly congruent with respect to the former, then, the speed of light is constant. In other words, the ***analysis situs*** of the speed of light constancy depends on the interval of the DC action eliminating the difference between FG and LK.

The irony of the Roemer discovery is also that by looking at the heavens as the future of the past, your mind is constantly reaching into the future in order to establish the truth beyond what you think the state of your present observation might have been. You cannot understand the speed of light without first understanding the speed of mind. However, if you think this little experiment is like that of a dog trying to catch its tail, you have missed the point. Although this experiment is going round and round, it is nonetheless going somewhere, because you have discovered sense deception. The speed of light is not a mental constant; it is only a physical constant; that is, a sense perception constant.

For instance, this constant is the proof that light does not travel at the same speed regardless of the motion of the source or of the inertial frame of reference of the human observer. That is not true. The speed of light is a constant only relative to the instantaneity of sense certainty, but not relative to the speed of the simultaneity of eternity of thinking processes. Now, look at the same problem of mind from the standpoint of Fermat during that same period of time. The historical time frame is essential, because historical changes always depend on specific time frames and specific individuals. ***Analysis situs*** is always historically specific.

Pierre de Fermat made many experiments respecting the propagation of light through different transparent bodies, such as air, glass or water, and he investigated how light traveled with respect to the human mind. My question to you is: what is the significance of the reflexive or refractive index of visible light with respect to human thinking? What is the significance of the human ability to think beyond the speed of light? For example, how do you measure the impact on the human mind with communications with distant space probes, for example, relative to the time it takes to send messages between the Earth and a spacecraft like Curiosity on Mars and back? You must account for the reciprocal fact that the so-called finite speed of light affects the human mind, and in turn, the universe is affected, itself, by changes in the human mind from the speed of light. The point is not to get more precise measurements, but to evaluate the change incurred by including mind into the equation. Here is how Lyn dealt with that question in his Weekly Report of September 5, 2012:

> "Well, we have the speed of light available to us! We use it! And we monitor things by this method. We communicate with Mars, in the time span, which no other sense-perception, or anything else can deal with! So, now we can begin to explore this process, the speed of light process, and we have a completely fresh view, of the questions to be asked! And that also means, that we have to think about the advantage, of what's the difference between the time span required to communicate with Mars by any other means, except the speed of light, and instead of relying upon ***sense-perception,*** we use the speed of light to define what sense-perception means. And that's a beginning!
>
> "Which means, we have to immediately get rid of this policy of the United States, now. And get into the supplemental experimental launches, which have to be done, to crack these problems, which first came on the scene at the end of the 19th century and the beginning of the 20th, and reopen all the questions on this thing! Throw these evil characters out of business, and get back on this!
>
> "We have experiments to be conducted, which we are capable of defining, if we build the experiments! And we can open up, and redefine the whole issue: ***What is the meaning of life?"*** (Lyndon LaRouche, ***Weekly Report***, September 5, 2012.)

We will only know what the significance of the human control of communication at the speed of light will be once mankind, as a planetary species, has lived under such a new mode of communication. This is why this social experiment must start now, with the opening of the Curiosity gateway to the future. As Lyn implied, this will change the meaning of human life forever in the same manner that Fermat changed the way the mind works by discovering the moral principle through which light "knows" which direction to take.

Fermat was one of the first scientists, along with Roemer, Huygens, and Leibniz, to understand how the speed of light affects the human mind. During the seventeenth century debate between Descartes and Fermat on the refraction of light, the crucial question of the "directionality" of light, that is, the "intentionality" of light was raised as an expression reflecting the presence of mind in the universe. This mind question created a major crisis among the Cartesians by the fact that intentionality of light was manifesting itself into the physical experiment of refraction by indicating the presence of the special relationship that exists between light and mental processes. The question was: How does light know where to go when it passes from one medium to another of different density?

This question was so significant in its universal implications that Descartes sent out his number one agent of influence, his editor, Claude Clerselier (1614-1684), to fight in his defense against Fermat's assertion that light knew where to go and how to change direction. In a 1662 letter to Fermat, Clerselier, tormented and revolted at the idea that nature might reflect the process of mind, refused to acknowledge that the least action principle of light propagation was similar to a moral principle of human conduct. Clerselier wrote:

> "1. The principle that serves as foundation for your demonstration, namely that nature always acts by way of the shortest and simplest paths, is but a moral principle, and not at all physical, which is not and could not be the cause of any effect of nature.
>
> "It is not, because it is not this principle that makes nature act, but rather the secret force and the virtue that is in each thing, which is never determined to a particular effect by this principle, but instead by the force which is in all causes and which comes together in a single action, and by the disposition which is actually found in all the bodies upon which this force acts.
>
> "And it could not be such [the cause of any effect of nature], because otherwise we would assume nature to have knowledge: and by "nature," here we mean only that order and that law established in the world as it is, which acts without foreknowledge, without choice, and by a necessary determination.
>
> "2. This same principle must put nature in an unresolved state, not knowing what to do when she must pass a ray of light from a rare body into a denser one. Because, I ask you, if it is true that nature must always act by the shortest and simplest pathways, and since the straight line is undoubtedly both the shortest and the simplest of all, then when a ray of light has to travel from a point in a rare medium to a point in a dense medium, is it not the case that nature must hesitate? For if you wish her to act by the principle of following a straight line immediately after the break, then isn't your path the shortest in time, while the straight line is shorter and simpler in measure? Who will decide, then, and who will pronounce himself on this matter? (Letter of Clerselier to Fermat, Saturday, May 6, 1662.)

The problem of Clerselier was that he could not accept that natural processes expressed the idea of "intention." And because there cannot be any intention, or preestablished harmony as Leibniz would say, there could not exist such a principle as a least action principle of nature. This problem kept resurfacing like an epistemological sore every time the question of a directionality of progress was raised until the abscess burst at the end of the nineteenth century.

Figure 12. Pierre de Fermat (1601-1665)

4- THE ANALYSIS SITUS OF PRIMITIVE ROOTS: POINSOT

Louis Poinsot used the same Leibnizian method of ***analysis situs***, to establish a solid foundation for the geometric properties of numbers, a form of axiomless geometry, that is, a form of indeterminate analysis that excluded all Euclidean or Newtonian flat earth types of reductionism to algebraic magnitudes. The Leibnizian idea that Poinsot followed not only led him to discover two new regular solids, the Great Dodecahedron and the Great Icosahedron, but also gave him the ammunition to fight the mediocrities of the flatland geometry of Euler. Thus, Poinsot contributed in overturning, ahead of his time, the a priori system of axioms, postulates, and definitions of what later became know in modern mathematics as ***topology***. Poinsot developed the constructive Leibnizian method of ***analysis situs*** whereby the characteristic of the situation had to be included in the solution to the geometric problems.

Figure 13. Louis Poinsot (1777-1859)

On July 24, 1809, during the first lecture that he gave at the Paris Science Institute, Poinsot declared his public affiliation to Leibniz and Carnot, and his rejection of Euler, with respect to his work in constructive geometry. The singularity of Poinsot in this war of ideas is of the utmost importance because he is the only mathematician in history who explicitly understood ***analysis situs*** as an epistemological instrument of warfare. For more details, see my report on Fusion is not Democratic. In the opening statement of that class, Poinsot reported on the following principle of method. He wrote:

> "The object of geometry of situation, as I have said, is to determine the order and the location of objects in space, without any consideration for the size and continuity of figures; such that the part of mathematical analysis, which would naturally apply to it, is the science of the properties of numbers or ***indeterminate analysis,*** like ordinary analysis is applied naturally to determined problems of geometry, and the differential calculus is applied to the theory of curves, wherever the curvature changes with imperceptible nuances. I have not found the place in the ***Acta of Leipzig,*** where Leibniz talked about the geometry of situation; but it seems to me that the idea he had of it conformed with the one I am giving here, and this is what can be seen quite clearly in this section of one of his letters on mathematical games. **'*Following the games that depend only on numbers, we have the games which further involve the situation, such as backgammon, checkers, and above all chess. The game called Solitaire also pleased me enough. However, I am considering it in a reverse manner, that is to say, instead of undoing a composition of pieces, according to the rule of this game, which calls for jumping into an empty place, and taking away the piece on which we jump, I thought it would be more beautiful*

if we reestablished what had been undone, by filling in a hole on which we jump; and by that means, we could propose to form such and such a given figure, if it were doable, as it surely could be done, since it was possible for it to be undone. But, some will say: "what is the purpose!" I would respond, to perfect the art of invention; because we should have methods for solving everything that reason can put before us.' " (Gottfried Leibniz, ***Letter VIII to M. de Montfort***, in Leibniz, ***Opera Philosophica***, quoted by Louis Poinsot in Op**.** Cit., p. 45-46.See Also Poinsot's groundbreaking ***Mémoire sur les Polygons et les Polyhèdres,*** read before the Institute on July 24, 1809.)

In light of this Leibnizian proposition in ***analysis situs,*** the mistake that Euler and his follower J. B. Listing made, stands out like a sore thumb. Listing had deliberately abandoned the Leibnizian idea of ***analysis situs*** and chose to propitiate Euler, by replacing the fruitful idea of Leibniz with what he called ***topology*****.** The erroneous underlying assumption of Listing was his rejection of the fact that not only was the method of ***analysis situs*** a playful geometric game, but it was also meant for solving axiomatic problems as determined by their location, that is, problems defined ***within the physical and historical context of their existence*****.** Instead, Euler and Listing, after him, retrograded back to the Mesopotamian flatland of Euclid by excluding from the field of geometry the crucial consideration of ***historical physical space-time,*** and reestablished a purely ***spatial,*** that is, Kantian a priori form of Euclidean geometry, based on arbitrary axioms, postulates, and definitions.

Thus, it must be concluded that the art of invention of Fermat, Leibniz, Poinsot, Gauss and Riemann still represents, today, an immensely untapped source of inspiration for a future watershed of discoveries.

The most effective metaphor of reciprocity that Poinsot developed in his epistemology of numbers was located in his discovery of the underlying ordering of primitive roots. How did he know the truth that all mathematicians before him had been incapable of discovering? His discovery was based on a crucial insight into ***the principle of reciprocity underlying the ordering of prime numbers***. Poinsot discovered the link and the mutual dependency which exists between primitive roots and their powers as a reciprocal of the dependency that exists between prime numbers and their dividing factors. By relying on this epistemological reciprocity, Poinsot discovered the actual underlying ***geometry of prime numbers and of primitive roots***. He discovered that the ***order*** came from a multiply-connected form of circular action of mind like Leibniz was seeking through his method of ***analysis situs***. Poinsot's insight was articulated as follows:

"Without a doubt, the consideration of residues generated from the division of a number by the successive powers of the same prime divider, emerges quite naturally in arithmetic, and it is from there that geometers seem to have begun the first part of the theory of numbers. However, it seems that those theorems have a much deeper source than is found in the science of mathematics, and that they must be derived from much higher order of principles, in a manner such that we can discover that it is not by chance that the mind got teased by such speculations, that they are not the result of pure curiosity, but that they have been drawn from the very nature of things, and that they form a fundamental part of mathematical science considered in the most general manner. In order to give you an idea, I will present, here, new demonstrations which are solely derived from the consideration of the ***order*** which can be actually conceived between several objects." (Louis Poinsot, ***Reflexions sur les principes fondamentaux de la théorie des nombres***, Paris, Bachelier, Imprimeur-Libraire, 1845, p.45.)

What Poinsot had in mind was the ***order of intervals of circular action*** extended between a series of points such as a, b, c, d, e, etc., all of which were ordered and determined in such a way that each and all the units of action that produced these intervals had the same reciprocal values reflected by an equal distance between each point as expressed by a whole number, and according to a continuous succession as in 1, 2, 3, 4, 5, etc.

From the vantage point of ***analysis situs***, Poinsot concluded that the numbers of primitive roots of any prime number P are those, which remain after the squares, the cubes, and the fifth powers, have been extracted from the intervals of action of any prime module P-1. Poinsot gave the example of the prime number 61, taken as a module. Since the number immediately preceding 61 is P-1, that is 60, it is clear that the simple factors of 60 are 2, 3, and 5. Poinsot showed that any other multiple can be broken down into these three simple factors, up to the 60th power. That being the case, he excluded all of the squares, the cubes, and the fifth powers. By eliminating the higher intervals of squares he left out half of 60, and he was left with 30. By eliminating a third of the intervals from 30, he was left with 20, and by eliminating a fifth of the remaining intervals from 20, he was left with 16. Therefore, there are 16 primitive roots of P = 61, which are held together invisibly by those excluded powers, just like prime numbers are held together by the power of 2 of the 256 series and their biquadratic intervals, as I have shown in a previous pedagogical.

The conclusion of Poinsot was as simple as it was elegant. He stated: "When you wish to find them (prime numbers), one considers all of the simple factors of a given number; and from the natural series 1, 2, 3, 4, 5, etc., one excludes all of the multiples of these simple factors. Here (with primitive roots), instead of those multiples, it is necessary to exclude all of the powers of exponents identified by these factors: the result, as one can see, is an operation of the same type, except from a higher level." (Louis Poinsot, Op. Cit., p. 75.) But, where is that higher level piercing from, and how do you access the domain of the universal principle that shines through the cracks among those shadow-numbers?

For my own purpose, here, I will use those cracks as represented by intervals of circular action as opposed to representing points of a polygon. That shift in emphasis will permit me to access the principle of reciprocity by going from a lower manifold of the Circle to the higher manifold of the Torus. From the standpoint of epistemology, the method that Poinsot used in order to discover the underlying ordering of primitive roots was the simplest and the most effective least action of all possible methods. His construction had the effect of a powerful grenade thrown into the foxhole of mathematicians, especially, Euler's sycophant Cauchy. As for Cauchy, I have settled the account with him in ***The Bourbon Conspiracy that Wrecked France's Ecole polytechnique,*** EIR, June 20, 1997. The same method I used in that article can be used, again today, against the pessimistic quackademic topologists who haunt the corridors of our universities.

Poinsot also settled the account with Euler's pessimism in ***Reflexions sur les principes fondamentaux de la théorie des nombres***, in which he showed that Euler had given up on ever finding a solution to the geometry of numbers, and most emphatically of finding the source of primitive roots. Poinsot made it clear that in the ***New Commentaries from Saint-Petersburg*** (Tome XVIII), Euler admitted that no one would ever be able to discover the underlying principle of generating primitive roots. As Poinsot said:

> "Euler admitted that no means of determining these roots could ever be found; that the demonstration which proves their existence indicates, in all cases, that no method exists to discover them; that we cannot find any relationship between a prime number and the primitive roots that belong to it, and from which could be deduced at least one of those roots; that such a law, which rules them, seems to be as profoundly hidden as that which orders the prime numbers themselves." (Louis Poinsot, ***Reflexions sur les principes fondamentaux de la théorie des nombres***, Paris, Bachelier, Imprimeur-Libraire, 1845, p.75.)

Indeed, by making such a statement, Poinsot was also conscious of establishing a simple way of understanding that the human mind was able to develop by going from lower manifolds to a higher manifold. Obviously, all of the Euler sycophants had every reason to be upset with Poinsot for correcting his flaw, because they refused to acknowledge the epistemological requirements of the Leibnizian ***analysis situs.*** That is an obvious mistake that Poinsot did not fail to correct as he attempted to bridge the gap caused by Euler by reducing the human mind to sense perception determinations. Poinsot, on the contrary, emphasized the orientation of the mind toward seeking a higher dimensionality that would establish the geometry of numbers. Poinsot made such a contribution when he discovered the geometric ordering underlying primitive roots. This crucial contribution by Poinsot should also serve as an exemplary application of the LaRouche's principle of higher energy flux density for the domain of epistemology. Although Poinsot succeeded in establishing that bridge between theory of numbers and epistemology, the proper connection between numbers theory and epistemology remains to be established.

I intend to demonstrate, here, that the means of discovering the underlying ordering of numbers, their raison d'être, does not pertain to the theory of numbers, as such, but to the epistemological function of the creative human mind; and therefore, it pertains properly to the domain of Epistemology. From that vantage point, this investigation requires more of a philosophical inclination than a mathematical one. It is for that reason that this pedagogical exercise is not aimed at improving the study of the domain of numbers, but at improving the mind by elevating the domain of numbers to the level of the science of the mind, and by showing how their shadows reflect universal principles. It is with that intention in mind that I will not treat numbers as mathematical entities, but as metaphorical shadows of mind in such a manner that the mind is able to pass over from a lower to a higher manifold.

I will, therefore, not treat numbers for the purpose of measuring or quantifying magnitudes, but for the purpose of expressing ***order, change, and situation*** relative to the mental powers of human creativity. In other words, I intend to consider numbers without any consideration to size or extension, and without considering the quantity of motion, force, or speed. Only situations of reciprocal actions are going to come under consideration as in games where the rules depend solely on the position of reciprocity of the different pieces.

However, as opposed to games where you take pieces away and replace them by others according to certain rules, this mindgame is more like a game of Solitaire in which all of the cards have to be discarded before you can reach the end result of the potential involved. Similarly this mindgame involves units of action that relate to periodical cycles whose spaces must be completely filled with the appropriate count before coming to the end of the process. In such an ***analysis situs***, numbers take a new form of application which is no longer for measuring extensions, but for measuring changes in mind power that account for axiomatic changes in the universe. The first original discovery of such a principle of change by inversion was from Pythagoras in his window of inversion of the Pythagorean Theorem.

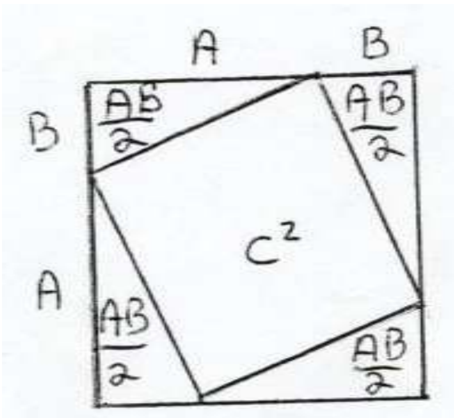


Figure 14. The Pythagorean Theorem Window of Inversion: Since $(A + B)^2 - 2AB = A^2 + B^2$, then, $(A + B)^2 - 2AB = C^2$. The underlying inversion that leads you to discover how $A^2 + B^2 = C^2$.

However, in order to properly situate the idea in the mind on this question, let's take one last case of failure of reciprocity and see why there is a fly in the ointment. Some Greeks imposed on themselves the rule of the straightedge and compass as a precondition for the construction of regular polygons much in the same way that mathematicians impose on themselves rules of classification. Everyone knows that the ancient Greeks constructed the side of the equilateral triangle and the side of the regular pentagon, under the physical constraint of the Euclidean straightedge and compass ***a priori*** rule. No one, however, ever revealed what this constraint meant to accomplish with that limitation. But, let's ask Gauss and Poinsot.

Although Gauss has demonstrated in his ***Disquisitiones Arithmeticae*** that the heptadecagon was constructible with straightedge and compass, the reason for its constructability did not reside in those instruments. Why not? Because, it is always the intention that counts and Gauss had no intention to demonstrate that. In his usual manner, Gauss was hiding his reasons. Unless the means of their construction and their intention are identical in their formulation, it is one thing to find a geometric construction for anything, but it is quite another to discover the reason why it is constructible. I do not wish in any way to reduce the merit of the young 19 year old Gauss for his discovery of the heptadecagon construction with a compass and a straightedge, but it is to Poinsot that is reserved the honor of having discovered the reason for that constructability.

The task that Poinsot undertook to investigate the underlying conditions of the constructability of the equilateral triangle and the regular pentagon was not less amazing than the one it took to discover its constructability. Poinsot discovered that the reason for the constructability of the triangle and the pentagon had nothing to do with the straightedge and compass. That rule was imposed from the proverbial outside. Poinsot was able to discover that the constructability of such polygons depended on a principle of reciprocity which was reflected in the fact that, when you subtracted 1 from 3 and from 5, you obtained the two first expressions of the power of two, which are, 2 and 4, and for that reason, any prime number minus one that gave you the next expressions of similar powers of two would also be constructible. Thus, the next polygons, 17, 257, 65537, etc., also known as Fermat primes, are also constructible. Poinsot concluded:

> "Therefore, it results from these considerations that the theory of numbers which, at first glance, appears to be a mere speculative mathematical oddity, presents itself on the contrary in a

> most natural way, and even constitutes the first essential part of the doctrine, as if it were the one on which the general science of proportionality acquired its fundamental principles. It is through this theory of order and numbers that the proper nature of algebra can be known, and which can give justice to this ***ambiguity***, or multiplicity of meanings that it attaches to its symbols, and which often presents us with several different roots or solutions of a problem where our mind sees only one. This is the property of algebra, which we have not yet become aware of, and which I will attempt to elucidate in order to shed a new light with this epistemology of science." (Louis Poinsot, Reflexions sur les Principes Fondamentaux de la Théorie des Nombres, Paris, Bachelier, Imprimeur-Libraire, 1845, p.7.)

It is worth repeating that one more time to hear the echo of Leibniz on the question of algebraic magnitudes. If the human mind is attached to such investigations of numbers, it is not because they are futile speculations or mere curiosities; it is because: "their source is more profound than mathematics and they must belong to principles of an order that is more elevated." (Poinsot, Op. Cit., p. 45.) That should be enough evidence that the principles of proportionality and reciprocity are of the utmost significance for the domain of mathematics.

5- THE ANALYSIS SITUS OF KNOTS: GAUSS, LISTING

Similarly, Gauss had referenced the same problem of measuring magnitudes when he investigated a limit theorem of magnetoelectrodynamics at the boundary of ***geometria magnitudinis*** and ***geometria situs***. In 1833, Gauss was attempting to discover the amount of work that was involved with a magnetic pole that moved around a closed curve in the presence of an electrical current. He studied the behavior of two interweaving loops and discovered what he termed the "Linking Number."

A quick comparison between Gauss and Listing is useful to understand from the standpoint of their different intentions. The Gauss linking integral is obviously constructed with the clear intention of mastering physical problems of electrodynamics relative to Earth, while the Listing knot reflects the construction of a pure topological object with an intention that says: "Can you guess what I am going?" One is task-oriented; the other is playing with itself.

Gauss developed the idea of ***numerical linking invariants*** in which the "linking number" represented the number of times an electrical current could circle around the magnetic field of the Earth and, reciprocally, how many times a magnetic current could go around an electric field. (**Figure 15**) The "linking number" can be either a positive or negative integer depending on the direction of the currents of the two curves. The experiment does not need to reflect look-alike, but work-alike. According to science historian, Erin Colberg, who wrote ***A Brief History of Knot Theory***, Gauss found that by combining the Ampere Law and the Biot-Savart Law, he was able to discover that the key to the reciprocal process resided in the invariant Linking Number of loops. Gauss noted:

"On the subject of ***analysis situs*** that Leibniz foreshadowed and about which only a few geometers (Euler, Vandermonde) have given a weak glance, we know close to nothing after a hundred and fifty years... A fundamental problem situated at the limit of ***geometria situs*** and of ***geometria magnitudinis*** consists in determining the number of intertwining knots around two closed or infinite curves." (Quoted by J. C. Pont, in Op Cit, p. 36. See also Carl F. Gauss, ***A Collection of Knots***, and two papers on ***Zur Geometria Situs*** , and ***Zur Geometrie der Lage fur zwei Rounmdimensionen***, 1794)

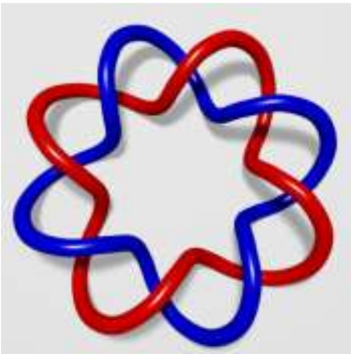


Figure 15. A Gauss linking integral knot with a P/T ratio torus of 2/8 (left) and a figure-eight Listing's Knot (right). Pay attention to the difference in intention between Gauss and Listing. What Gauss called for was to build eight electromagnetic observatories around the Earth based on understanding electromagnetic process such as this ***analysis situs*** configuration in mind. However, what does the Listing knot represent?

The Gauss study later led to an interesting ***analysis situs*** of Torus Knot making use of the Gaussian reciprocal notations of *p* and *q* in all cases where *p* is prime to *q* and ***vise versa*** where both reflect reciprocity. For example, after Gauss, the Torus Knot became defined in the following manner:

"A (p, q)-torus knot is obtained by looping a string through the hole of a torus $p$times with $q$revolutions before joining its ends, where $p$and $q$are relatively prime. A (p, q)-torus knot is equivalent to a (q, p)-torus knot. All torus knots are prime (Hoste *et al.* 1998, Burde and Zieschang 2002). Torus knots are all chiral, invertible, and have symmetry group D_1 (Schreier 1924, Hoste *et al.* 1998)." (Torus Knot)

This crude method of putting a string into a torus hole may be practical, but it is not epistemologically viable. What is required is a method of construction which applies and reflects the epistemological conditions of an axiomatic change. The epistemological method that is required is to demonstrate how to make the leap from the circle to the torus by going through the transformation between a singly-connected manifold from a doubly-connected manifold. This epistemological transformation implies two important steps. First, the method of ***analysis situs*** construction must be applied from the principle of reciprocity whereby what you say you do is the reciprocal of what you do you say: the unity of effect is that the intention and its realization must coincide; otherwise, the process will be reduced to a mere mathematical game. Secondly, the generative process is not a deduction from the past, but an inversion proceeding from the future into changing the past by way of time-reversal.

This is the way Gauss discovered the key to the ***analysis situs*** interaction of reciprocity between magnetism and electricity. He discovered it in his mind first. Unfortunately, the scientific community did not pursue this new line of inquiry any further and the significance of such a reciprocal interaction remained in the dark to this day. One historical occurrence, however, may explain why the work in this domain may have come to a halt.

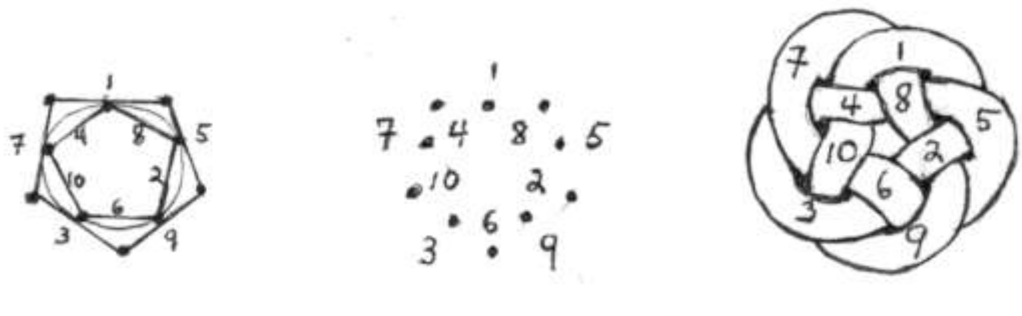


Figure 16. The axiomatic change of manifold does not proceed from the circle to the torus, but from the torus back to the circle, in the same sense that the future cannot be deduced from the past, because the future is always ahead of the past and never follows it. Future and past are therefore reciprocals.

When the work of Gauss came to the attention of William Thompson (Lord Kelvin) and to Clerk Maxwell, the work that Gauss had pursued in the footsteps of Ampere marked the beginning of the most important epistemological fight in modern physics, dividing the world of physics into two camps.

Kelvin got tangled up into thinking that the so-called elements of nature were made up of different physical knots, and mathematicians have been playing with different kinds of physical knots and strings ever since. This silly business led to the insane situation we find science in today.

There were those who supported corpuscular theory of matter and there were those who supported the wave theory of matter. My task, here, is not to go through the pros and cons of this sterile debate, but to point out that if the "paradox of the wavicle", as Lyn identified it, is not solved as a an axiomatic question of epistemology, the reason is because the principle of reciprocity has not been applied, and that whenever the principle of reciprocity is not applied in science, a significant crisis is bound to erupt.

Figure 17. Carl Friedrich Gauss (1777-1855)

Figure 18. Bernhard Riemann (1826-1866)

6. THE LAW OF QUADRATIC RECIPROCITY AND *ANALYSIS SITUS*: GAUSS

Gauss examined the ***analysis situs*** process of Leibniz very seriously from the vantage point of quadratic reciprocity, from which he constructed his fundamental theorem, or what he called his "golden theorem" that became known as the ***Law of Quadratic Reciprocity***. Here, reciprocity means that two integers, *p* and *q* play mutually opposite congruent roles in a two-way mirror function: if *p* is a quadratic residue or nonresidue (mod *q*), then, conversely, *q* must also be a quadratic residue or nonresidue (mod *p*). In other words, the process acts according to the intention of the congruence that takes place by a mutually agreed harmonic inversion. That is also the condition for success among the reciprocity of the three-mind problem in the Peace of Westphalia. For those who are not familiar with Number Theory, I will simply define this harmonic inversion of a quadratic residue or nonresidue as a number C that is relatively prime to a second number B for which a third number A exists as a reciprocal of C, because its square gives the same remainder as C, after it is divided by B.

The interesting twisting anomaly, here, is that the ***analysis situs*** ordering of both residues and nonresidues all reflect a reciprocal inversion, because in this unique case, intention of congruence and the resulting action of the congruence coincide, as if to establish peace for the purpose of avoiding conflict. However, let's look a little closer at this idea of quadratic reciprocity that Gauss developed and which became known as the ***Principle of Quadratic Reciprocity***. What Gauss said about the validity of his principle is most interesting because it provides us with a rare moment of truthfulness on a discovery of principle by a mathematician who is not a mathemagician, and whose concern is to apply mathematics to physics as opposed to simply playing games. Gauss wrote:

> **"**The questions of higher arithmetic often present a remarkable characteristic which seldom appears in more general analysis, and increases the beauty of the former subject. While analytic investigations lead to the discovery of new truths only after the fundamental principles of the subject (which to a certain degree open the way to these truths) have been completely mastered; on the contrary in arithmetic the most elegant theorems frequently arise experimentally as the result of a more or less unexpected stroke of good fortune, while their proofs lie so deeply embedded in the darkness that they elude all attempts and defeating the sharpest inquiries. . .
>
> **"**The theorem which we have called in sec. 4 of the ***Disquisitiones Arithmeticae***, the Fundamental Theorem, because it contains in itself all the theory of quadratic residues, holds a prominent position among the questions of which we have spoken. . . I discovered this theorem independently in 1795 at a time when I was totally ignorant of what had been achieved in higher arithmetic, and consequently had not the slightest aid from the literature on the subject. For a whole year this theorem tormented me and absorbed my greatest efforts until at last I obtained a proof given in the fourth section of the above-mentioned work." (Quoted by Peter Martinson. Source not provided in ***Principle of Quadratic Reciprocity***.)

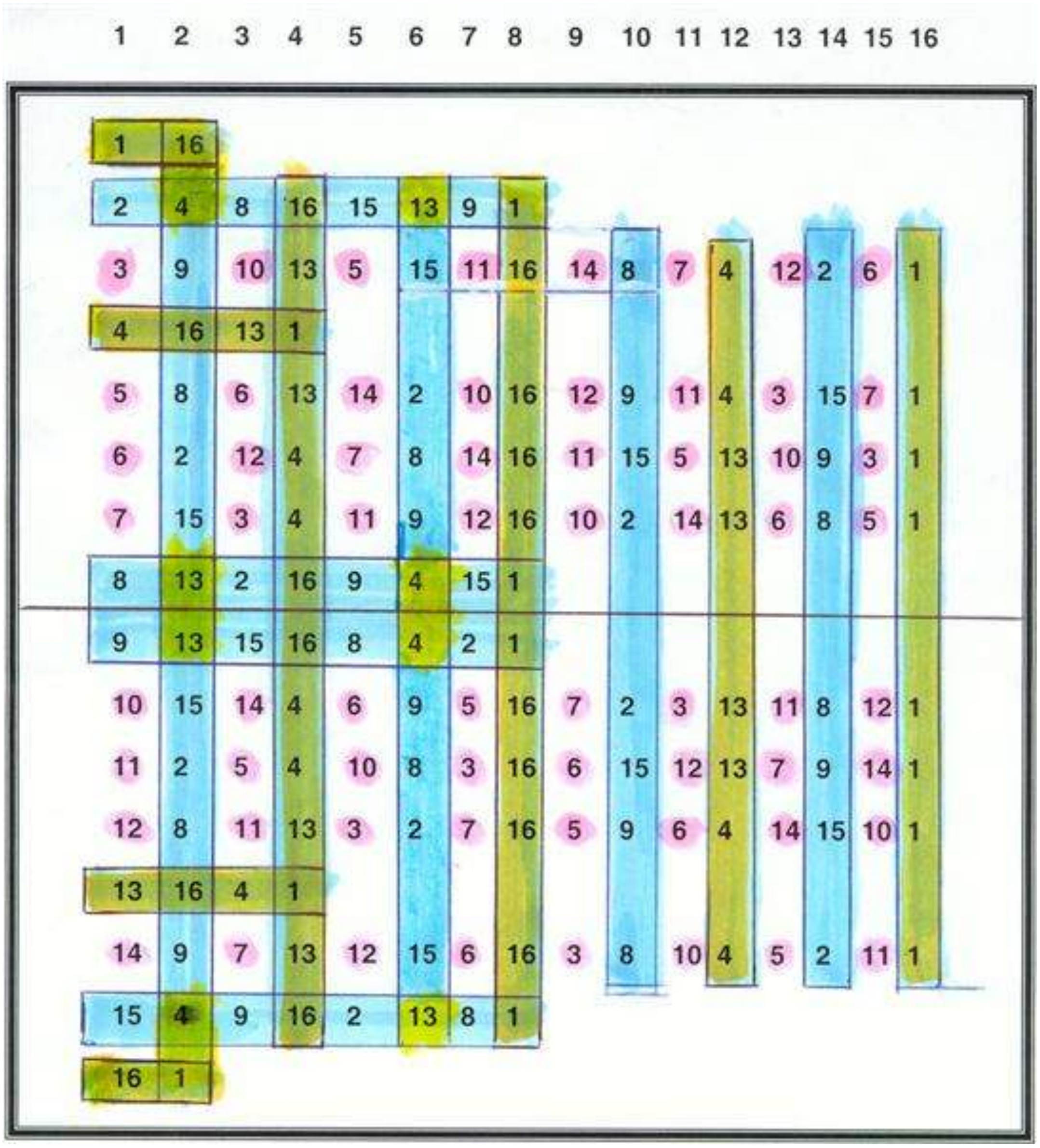
Gauss was interested in this question of reciprocity of numbers because the discovery of principle implied an axiomatic change inside of the human mind. He realized that the most natural means for the human mind to discover a universal principle that did not exist before, was not to read what already existed on the general subject, but was to discover it by projecting into the future and by turning his mind inside-out, like Alice did by going through the mirror. But, this had to be done in a manner such that the dissymmetry of the chirality that takes place during the inversion process becomes the measure ***in situs*** that causes the change inside of his mind. That is extremely important to understand, because this is also how to recognize the dynamic location, or the ***in situs,*** of paradoxes inside of your own mind. And the joy of discovery comes when reciprocity becomes a function of inversion in the same way that the inversion becomes a function of reciprocity. As the French would say: ***"Ca crève les yeux!"***

For reasons that should become quite obvious, therefore, the human mind relishes in solving those types of problems, because they are both scary and fun at the same time. Scary because it is as if your life depends on it, and it's fun, because once the critical leap of faith is made, your immediate reaction is to say: "That's all it was about? Why was I blocking for so long?" As Lyn keeps reminding us, there is no higher metaphysical reason for doing something that is axiomatically valid than because it's fun. Fun is the highest expression of happiness in the human mind's creative powers, even when the experiment gets curiouser and curiouser! And to prove it, take a peek in ***Disquisitiones Arithmeticae***, § 107, and look at how Gauss goes through the mirror of the principle of reciprocity:

> "It is very easy, given a modulus, to characterize all of the numbers that are residues or nonresidues. If the number = m, we determine the squares whose roots do not exceed half of m and also the numbers congruent to these squares relative to m (in practice there are still more expedient methods). All numbers congruent to any of these relative to m will be residues of m; all numbers congruent to none of them will be nonresidues. But the inverse question, ***given a number, to assign all numbers of which it is a residue or a nonresidue, is much more difficult."*** (Carl Friedrich Gauss, ***Disquisitiones Arithmeticae***, Translated by Arthur A. Clarke, S. J., Yale University Press, New Haven, 1965, p. 72)

Gauss immediately followed by demonstrating that all quadratic residues are of the form of 4n + 1, while all quadratic nonresidues are or the form 4n + 3. This is the same type of inversion that Leibniz had identified under his epistemological method of inversion of tangents for the construction of the catenary curve. This must first look totally impossible, and that is why it is worth trying. The process of division of the residues and nonresidues by half is also a direct expression of the power of two in ***Tai Chi***, and in the Leibniz Characteristic, as I have developed in my report on Fohi's Noetic Characteristic of Change. The way that Leibniz put it was: "***Given the property of a tangent, find the curve!***" And, that property is that all of your mental motions must be at right angle to your mind's radius of curvature.

Furthermore, this Gauss theorem is the key to the application of the principle of reciprocity in magnetism and electricity when the two processes are related at right angle to each other. My point, here, is not to go through the demonstration that Gauss developed for this theorem, but to note that this Gaussian discovery of principle is the historically specific location where it can be discovered that magnetism acts on electricity as electricity acts on magnetism. This electromagnetic question is one of the crucial areas of science to be revived and reoriented properly if we are to have any science in the future. Now, let's have a look at how all of the reciprocals of 17 are distributed. (See **Figure 19.**)



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	16														
2	4	8	16	15	13	9	1								
3	9	10	13	5	15	11	16	14	8	7	4	12	2	6	1
4	16	13	1												
5	8	6	13	14	2	10	16	12	9	11	4	3	15	7	1
6	2	12	4	7	8	14	16	11	15	5	13	10	9	3	1
7	15	3	4	11	9	12	16	10	2	14	13	6	8	5	1
8	13	2	16	9	4	15	1								
9	13	15	16	8	4	2	1								
10	15	14	4	6	9	5	16	7	2	3	13	11	8	12	1
11	2	5	4	10	8	3	16	6	15	12	13	7	9	14	1
12	8	11	13	3	2	7	16	5	9	6	4	14	15	10	1
13	16	4	1												
14	9	7	13	12	15	6	16	3	8	10	4	5	2	11	1
15	4	9	16	2	13	8	1								
16	1														

Figure 19. Reciprocity within module 17. Horizontally, this table shows that all of the numbers reflect periodic waves of all integers from1 to 16 (mod 17). Everywhere, as if by coincidence, their vertical columns reflect reciprocity. The four quadratic (blue) and four biquadratic (green) residues (mod 17) are paired in their respective reciprocals: [1-16], [2-15], [4-13], [8-9]. The quadratic nonresidues are all paired as primitive roots (pink): [3-14], [5-12], [6-11], [7-10]. There are always an equal number of quadratic residues and nonresidues.

The reason why this is the case is not easy to establish, because reciprocity is primarily a principle of the human mind, and most mathematicians do not know how to use their minds. In the physical domain, for example, one finds that the principle of reciprocity is the fundamental principle connecting the magnetic field to the electric field, but most scientists don’t even see that. Shadows of that relationship are also partly expressed by the time-harmonic cycles of current densities of interchange between electrical currents and voltages, as exemplified by the ***Lorentz reciprocity***. But again, people don't pay attention to that reciprocity as pertaining to the activity of the mind, because they don't realize that this is how the intention of their minds works.

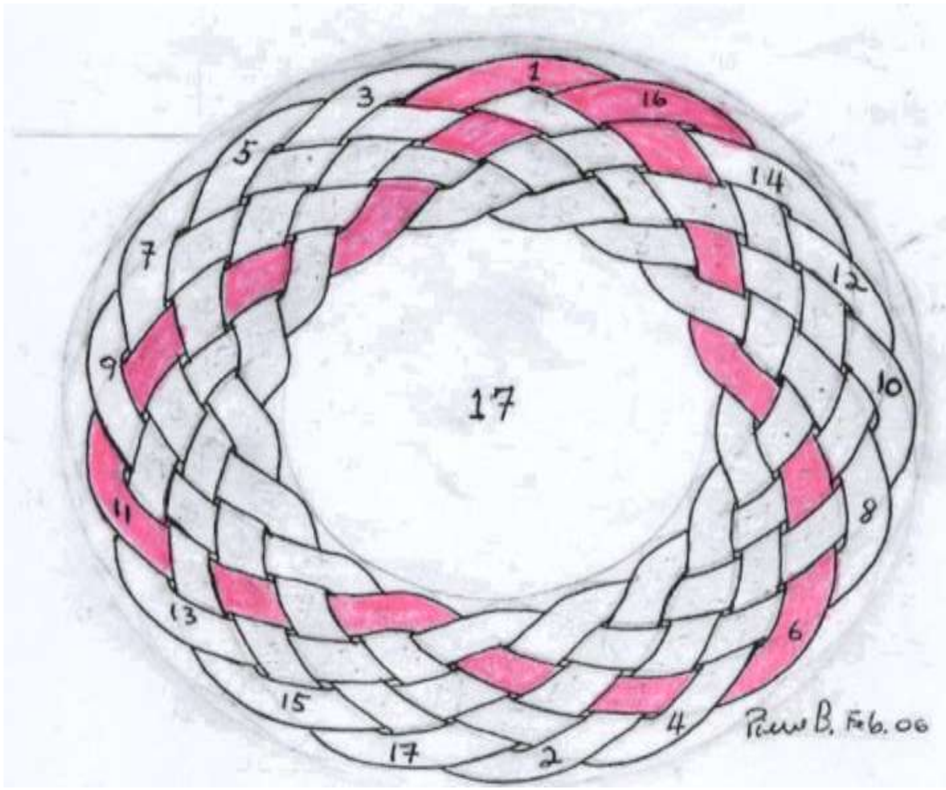


Figure 20. Given 6 as a primitive root of 17, find the number of waves, which can be correlated between the toroidal numbers and the ordering of the series of congruent reciprocal nonresidues. The ordering of those remainders is as follows: 6, 2, 12, 4, 7, 8, 14, 16, 11, 15, 5, 13, 10, 9, 3, 1. This heptadecagon is constructible because it is a Fermat Prime, and the Linking Number, as Gauss would say, has the Poloidal-Toroidal ratio, or P/T = 6/17.

In the domain of mind, similarly the same relationship exists when two minds relate to one another through the different levels of flux-density as exemplified by the LaRouche principle of increase in energy flux-density through discoveries of principle.

Note that all of the residues and nonresidues of module 17 are distributed in a natural order of succession around the torus (**Figure 20.**), that is, following as many successive waves of 6 units of action as the remainder indicates. Those are the boundary conditions of the system. The way to develop this process is to proceed clockwise, one poloidal wave at a time, around the torus starting from the last integer in the series, which is 1, and continuing around the torus until all of the subsequent remainders are found before returning to 1. The number of waves leading to each of the next remainders corresponds to the value of the preceding remainder. That is the key to understand how you are able, "***given a number, to assign all numbers of which it is a residue or a nonresidue,"*** that is to say, with respect to Riemann's account of an n-dimensional manifold, it is notable that the measure of the spatial relationship must correspond to h times p-1/2 different functions of position.

Now, have a taste of the following mind-filling doughnut. The general theorem for those doughnut lovers has been derived from Poinsot and the general theorem can be found elaborated in my report on Fusion Power is not Democratic:

IF YOU HAVE p WAVE INTERVALS ARRANGED IN A TORUS, AND YOU JOIN THEM FROM h TO h, h BEING A PRIMITIVE ROOT OF p, YOU WILL NECESSARILY PASS THROUGH ALL OF THE p INTERVALS BEFORE RETURNING TO YOUR STARTING POINT, AND YOU WILL NECESSARILY HAVE COVERED h $\frac{(p-1)}{2}$ THE ENTIRE MODULAR CIRCUMFERENCE OF THE TORUS.

In general, since the wave motion of the torus is the best-chosen configuration for expressing both positive and negative curvature in a complex motion, this primitive root type of configuration should also be most appropriate for describing the complex ***analysis situs*** of cyclical-astrophysical phenomena, as well as streamline fluid motion of fusion processes, such as magneto-hydrodynamic phenomena in hot plasmas. The reader should be reminded of the epistemological reference that Riemann made to the ***analysis situs*** of Leibniz in this respect, as opposed to the topology of Listing. Riemann wrote:

> "In the study of functions which result from the integration of total differentials, some theorems pertaining to ***analysis situs*** are almost indispensable. Under this designation employed by Leibniz, although in a slightly different sense, we can order a part of the study of continuous magnitudes where we do not consider these magnitudes as existing independently of their position and as measurable by each other, but where one studies only the relationships of situation of locations and regions, in completely abstracting all metric relationships." (Bernhard Riemann, ***Theory of Abelian Functions, Crelle's Journal***, V. 54, 1857.

Again, this requirement of abstracting from any form of measurement of algebraic magnitude is indispensible in the present case. Here, the only measure you require is a measure of change whereby reciprocals meet the Gauss-Poinsot-Riemannian manifold requisite of h (p-1)/2 surface directions of intervals. This is the general physical-space-time constraint for any electromagnetic form of reciprocity.

The fact that Poinsot used the same method of ***analysis situs*** to warn future generations against the pessimism of Euler merely serves to confirm the universal value of the Leibniz principle of felicity in constructive geometry. The ***Analysis Situs genealogy*** (**Figure 2**.) of this epistemological heritage, however, as presented by Pont, is quite chaotic and represents, historically speaking, a watershed of confused mathematical misdirection. It is most unfortunate that so many mathematicians missed the boat, simply because they did not realize that the real fun part was located in the cooking. I guess mathematicians just don't know how to have fun!

This is also why it is much more difficult to find a modulus for which a given number is a quadratic residue or nonresidue, than it is to find a residue or nonresidue for a given modulus, because your mind must be oriented to the future, and this becomes impossible when your mind is used to thinking from the past. In our case here, as is the case for all numbers, the answer to the question of this inversion cannot be found unless you discover the underlying principle of reciprocity which distributes both residues and nonresidues. And the principle of reciprocity cannot be found if you don't look into the fact that numbers, all numbers, pertain to ***closed circular action;*** that is, ordered from what is ahead of you. That is the key. If you cannot admit this underlying principle of ***closed circular action***, as the underlying principle of all numbers, then, not only you cannot derive any sort of number from any module, but you cannot derive any module from any number. However, if you understand this underlying property of numbers, then, you understand that 17 is a quadratic residue of all its quadratic residues, and similarly, a quadratic nonresidue of all of its quadratic nonresidues. It's as simple as that.

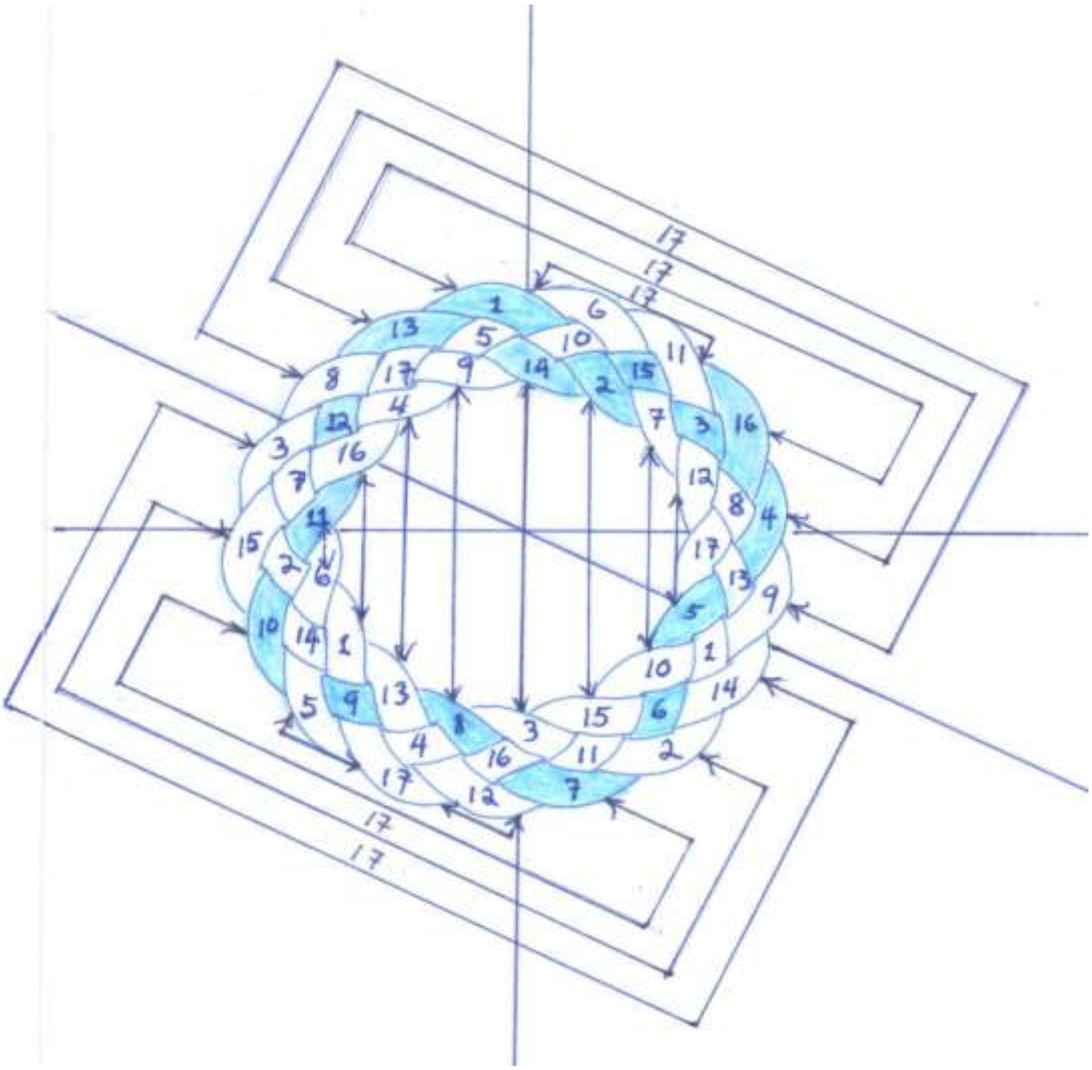


Figure 21. Reciprocity distribution of biquadratic residue 4 (mod 17). Here, the P/T ratio is h (h-1)/2 = 32. The reciprocal difference between the internal and the external rims reflect approximately the tilt of the Earth's ecliptic of 23.5%. The ***electromagnetic geography*** of the Earth's chemistry probably also reflects similar reciprocity. Note how the four biquadratics are generated within the first five waves.

Finally, consider that my notation for knots by whole numbers (**Figures 20.** and **21.**) is determined by intervals of action with the intention of demonstrating how to solve three-mind problems, or ***Ren +1*** problems. On the other hand, Gauss devised a notation, also by whole numbers (**Figure 22.**), which is determined by overlaps (positive integer) or underlaps (negative integers) in order to facilitate the decoding of complex knot situations. The Gauss intention is meant to account for all of the crossings of a closed or infinite curve. For instance, this Gauss pentagonal Notation for Knots follows the intersections by crossing over or under in the following sequence of 22 crossings: 1 -2 3 -4 5 6 -7 -8 4 -9 2 -10 8 11 -6 -1 10 -3 9 -5 -11 7. Each number has two values, positive and negative. Compare with the pentagonal torus of **Figure 16**.

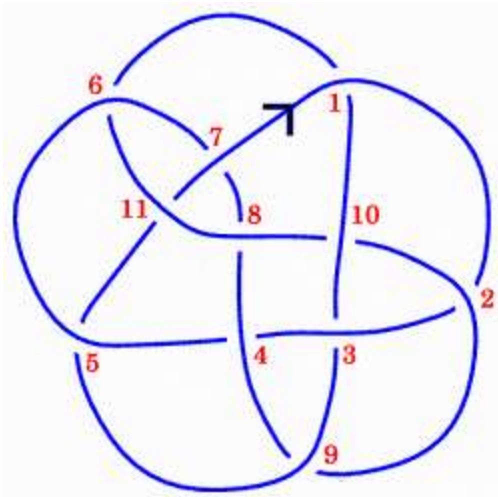


Figure 22. The Gauss code for knot notation.

7- RECIPROCITY OF COMMUNICATION AT THE SPEED OF LIGHT: CURIOSITY

Finally, I thought it would be important to examine this question of reciprocity and ***analysis situs*** more precisely as an axiomatic function of the creative process of the human mind by concluding with Lyn's initiative concerning the question of the speed of light with reference to the landing of CURIOSITY on Mars. This is how Lyn posed the problem:

> "And also, the other thing is the question of, what is the meaning of the speed of light? Which is this apparent limitation which we're dealing with. And now, we also have the fact of one thing: The speed of light implies, we can reach Mars, by the speed of light, if we can use the speed of light as a communications system, which is what we're trying to do. Which means, we have changed the reference. We now have said, "Well, wait a minute, what about biology? What about the definition of the way we define life? Isn't that a little bit absurd, when we consider that these other considerations are entering, such as the function of the human mind?" (Lyndon LaRouche, ***Weekly Report for Wednesday September 5, 2012***.)

So, what is the axiomatic significance of the limitation of the speed of light with respect to the human mind? Here, there are two things to remember. One is, how does the limit of the speed of light affect the human mind as an axiomatic limit condition? And two is, how does the mind break that limit by going beyond to the speed of mind? First and foremost, consider the speed of light as the timely singularity which entirely focuses the mind toward mastering relativity of physical-space-time. That's the main change that Einstein initiated as early as the first decades of the twentieth century and that mathematicians sabotaged with a false conception of limit. Secondly, the speed of light focuses the mind on improving the economic conditions of mankind for tomorrow. These two aspects are both essential to investigate if the present crisis in science is to be resolved. Again, the best way to proceed is to examine the question from the standpoint of the principle of reciprocity.

The best example of an epistemological application of the principle of reciprocity with respect to the speed of light comes from the recent NASA landing on Mars of the Rover CURIOSITY. Today, NASA's Mars Rover CURIOSITY is accomplishing on that planet what Roemer initiated with Leibniz in 1675, in discovering the speed of light. But, it has gone much further. CURIOSITY is a direct expression of ***analysis situs*** in defense of Earth. From that standpoint, mankind has now been able to live within the epistemological domain of the speed of light as a new limit situation for the protection of mankind.

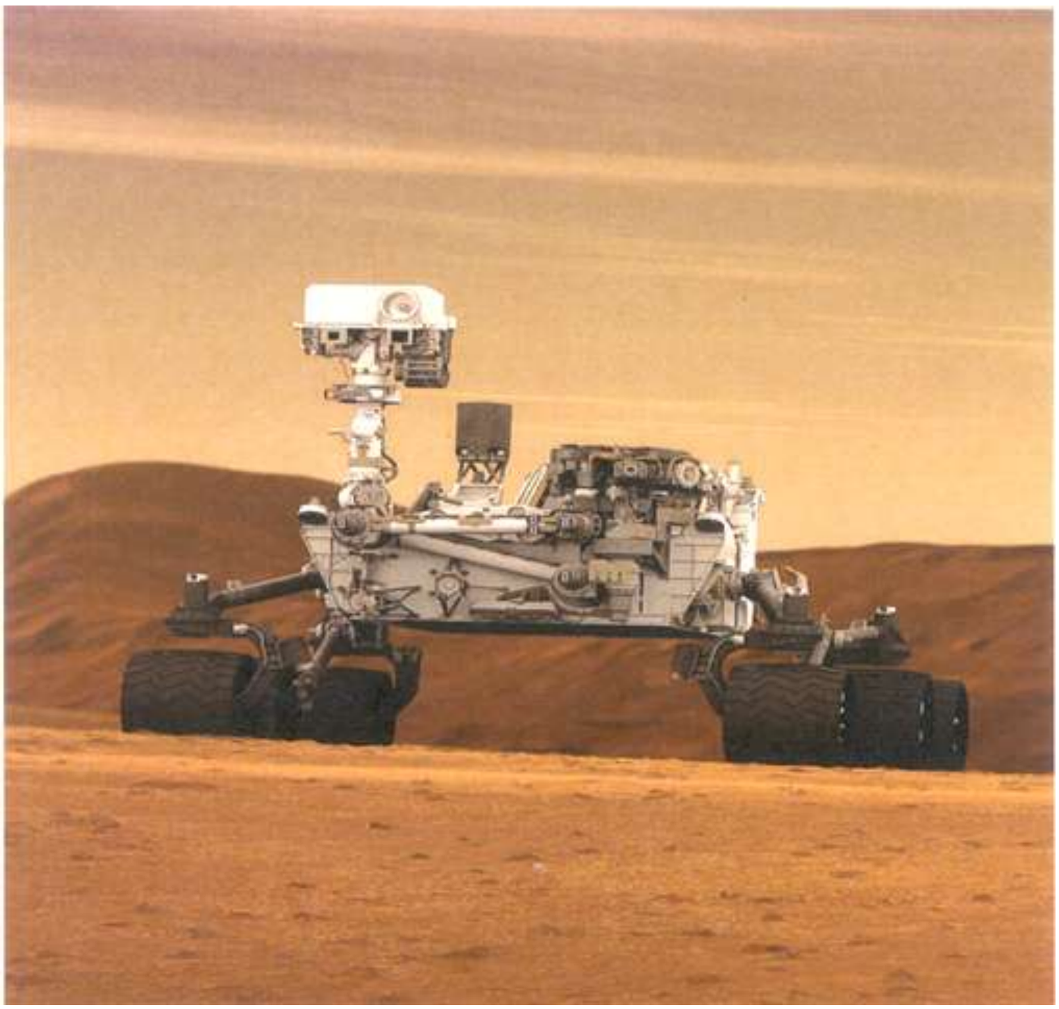


Figure 23. An artistic rendition of the Curiosity Rover.

However, that new frame of reference was not to be realized until CURIOSITY landed on Mars on August 5, 2012 at 1.30 AM Eastern Time. Lyn made the crucial point about this aspect of the development of space-exploration, when he wrote:

"For example, the launching of a higher rank of infra-space communication, "Curiosity," represents a quality of development which impels us to change our thinking about the significance of communications within and beyond the confines of the Solar system. The need to deal with what we would presently consider, primarily, as very naughty and dangerous asteroids, directs us to build up a two-way system between Mars-base and Earth-base, which, by employing speed-of-light communications between Mars and Earth—and on certain things between, might well prove to become a prospective means of preventing the threatened extinction, as by the actions of errant asteroids and comets, of human life on Earth.

"What we have, in that same general context, is the more general challenge of (hypothetically) relying only on synthetic successors to such synthetic creatures as "Curiosity," to defend life on Earth by means of synthetic arrays deployed as installations operating on Mars: the defense of Earth (as against actually dangerous asteroids) from electronic bases on Mars, by aid of a command based on Earth." (Lyndon LaRouche, THE SECOND FRIDAY BEGINS, LaRouche PAC, October 7, 2012)

Note the three moments of historical specificity relating to the speed of light as a new axiomatic frame of reference for human life, the ***three step analysis situs***:

- In 1675, Roemer established the speed of light by discovering the time difference when Io was going to come out of eclipse at two different times during the year.

- In 1877 A. A. Michelson repeated a similar experiment that gave Einstein a foothold for his Theory of Special Relativity.

- In 2012, Curiosity landed on Mars and established, for the first time in history, the reciprocity of the speed of light for mankind at any time in the future.

As Lyn showed, the significance of curiosity comes from the fact that it has created a new epistemological platform of existence for mankind, with a higher form of reciprocity of communication among human minds within the universe as a whole. Man can now communicate in all directions within the confine of the universe, backward and forward, without the requirement of being physically there. The speed of light makes him present and active in the universe wherever he wishes. All that he requires is to have his antennas out there and be extended at those distances. This new human presence in the universe demonstrates that our extended epistemological sensorium can be anywhere in the universe and be out there for the benefit of mankind by means of reciprocal probes, and be there under the regime of the speed of light without necessarily being physically present in those locations: "***Subsummus in situs***."Man was never able to exist in such an extended manner before now, and at that axiomatic limit. This is indeed a giant step for the human mind, because the communication frame of reference of the human mind has now been changed permanently for all time to come.

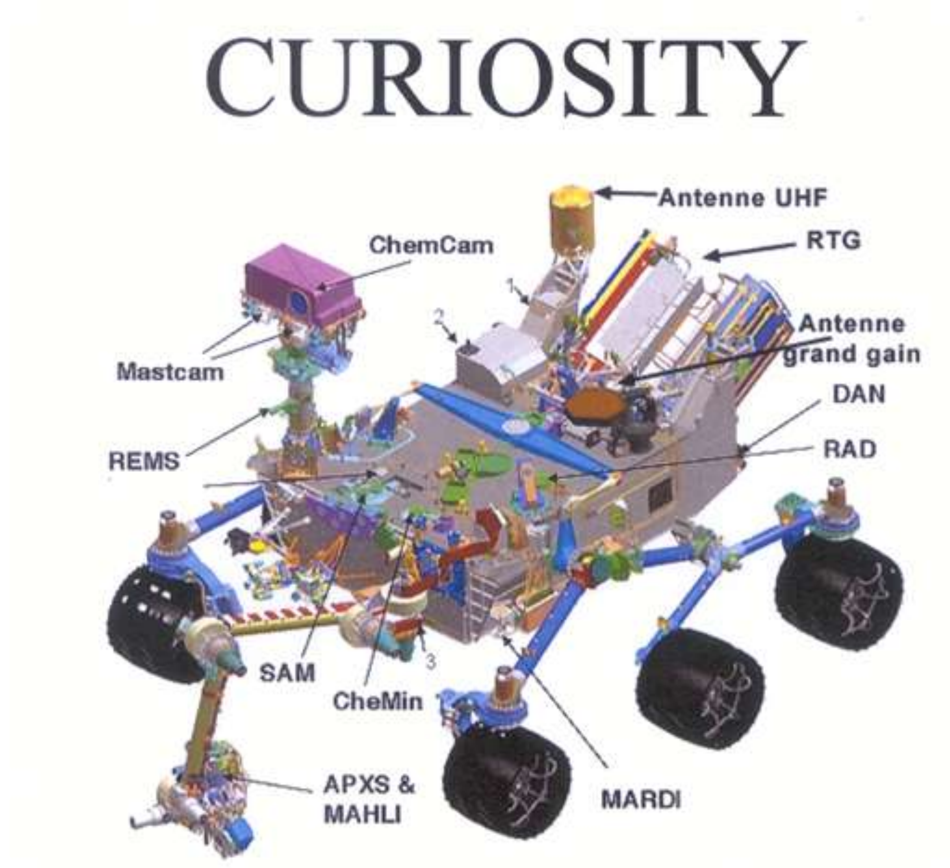


Figure 24. The figure above shows the location of the ten science instruments on the rover. There are four categories of instruments: the remote sensing instruments Mastcam (Mast Camera) and ChemCam (Laser-Induced Breakdown Spectroscopy for Chemistry and Microimaging) located on the remote sensing mast; the contact science instruments APXS (Alpha Particle X-ray Spectrometer) and MAHLI (Mars Hand Lens Imager) located on the end of the robotic arm; the analytical laboratory instruments CheMin (Chemistry and Mineralogy) and SAM (Sample Analysis at Mars) located inside the rover body; and the environmental instruments RAD (Radiation Assessment Detector), DAN (Dynamic Albedo of Neutrons), REMS (Rover Environmental Monitoring Station), and MARDI (Mars Descent Imager).

Therefore, this form of permanent presence of mankind in the universe marks a new threshold for the advancement of the human species in space exploration. Mankind can see itself, permanently, from the outside. He can now begin to know as he is known by the universe. This is also the beginning of a unique journey into the domain of epistemological reciprocity between the human mind and the mind of the universe whereby this new communicating function can now operate in the past, present, and future, within new limited forms of simultaneity of eternity. In other words, Curiosity has given humanity a permanent new form of existence which has the power to change the time frame of the universe by changing the way man thinks of himself in the universe. Such is the most recent application of the Leibniz characteristic of ***analysis situs.*** As he wrote in the concluding part of his1679 letter to Huygens:

"Furthermore, this point of view, which offers such facility in demonstrating truths which have been proved only with difficulty by other methods, also opens a new type of calculus to us which is far different from the algebraic calculus and is new both in its symbols and in the application it makes of them or in its operations. I like to call it ***analysis situs***, because it explains situations directly and immediately, so that, even if the figures are not drawn, they are portrayed to the mind through symbols; and whatever the empirical imagination understands from the figures, this calculus derives by exact calculation from the symbols. All other matters which the power of imagination cannot penetrate will also follow from it. Therefore this calculus of situation which I propose will contain a supplement to sensory imagination and perfect it, as it were. It will have application hitherto unknown not only in geometry but also in the invention of machines and in the descriptions of the mechanisms of nature." (Leibniz, ***Philosophical Papers and Letters***, Op. Cit., p. 257.)

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