

ON VERNADSKY'S SPACE

More on the Calculus

by Lyndon H. LaRouche, Jr.

September 13, 2007

*Once again, for the second time, my receipt of the translation of Academician V.I. Vernadsky's **On the States of Physical Space**, as a Festschrift for the occasion of my 85th birthday, prompts the following additional remarks. This second time, as part of a continuing discussion with the basement team on a crucial feature of the content of my contribution to EIR, Vol. 34, No. 39, I focus what I have recognized as much needed, deeper attention to a still deeper epistemological implication of the same subject-matter.*

Despite all that which has been said on the subject of physical space-time, between me and the LaRouche Youth Movement (LYM) teams, one may still wonder: *how well did Carl F. Gauss know the orbit of the asteroid Ceres?* The orbit, as Gauss defined it correctly at that time, is known; but, the *underlying* principles of that universe in which Gauss's thinking was actually located, remain poorly understood, even among competent professionals, still today.

The issue so posed, might be regarded as "valid but esoteric;" it, nonetheless, must be considered as of crucial importance.

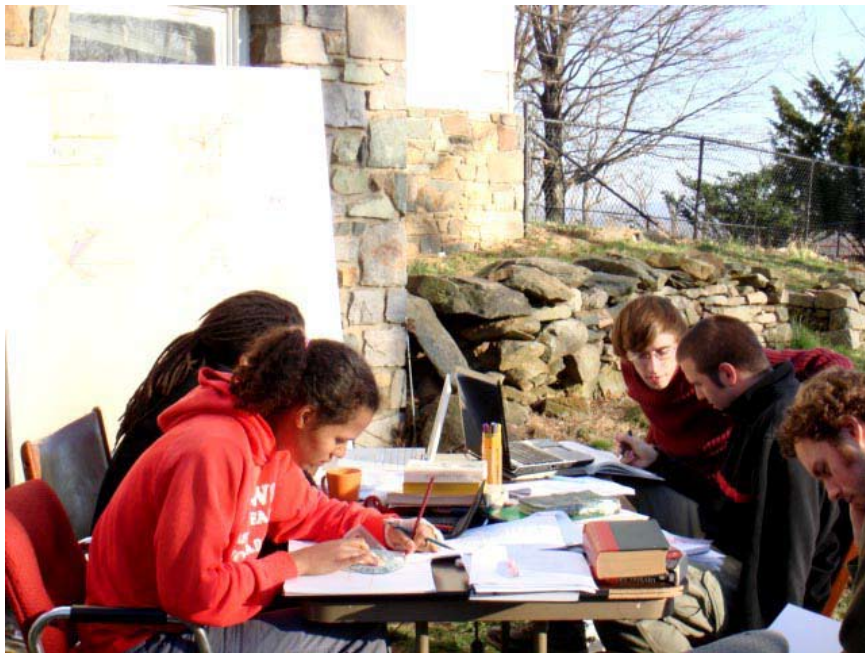
Here, in this present location, I focus on the relevant implications of the matter of the calculus itself. I summarize what I have said, during the interim, as said between me and some members of "the basement team." Unavoidably, I shall frequently restate what I had stated in the preceding reaction to the implications of the LYM's contribution to the *Festschrift*. What I add, as interpolations, here, on this occasion, opens the field of discussion within a much larger and deeper realm of exploration.

As I have reported earlier (repeatedly), the time came, when I was to meet with that LYM team of volunteers which

had been chosen by others, then assembled, with me, for beginning its mission of reliving of the actuality of the process of Gauss's discovery of that orbit. That was the occasion on which I first challenged the LYM to discover the often overlooked difficulty which confronts any student of Gauss's relatively successful result in this matter.

The problem, as I had emphasized this in earlier publications, is that, Gauss, after the 1800 death of Abraham Kästner, was working within that hostile environment for competent European science which had been created by a succession of adverse political developments centered on the reactionary developments which had occurred in France, from July 14, 1789, through the Duke of Wellington's appointment of France's so-called Restoration monarchy and the related Vienna Congress. These were, most notably, adverse conditions which were being shaped under the spread of Romanticism, shaped by both the cultural impacts of the Napoleonic wars and, later, under the regime of Prince Metternich and his like from the period of 1815 onwards.¹ Much of Gauss's life and work, was lived under those special, menacing political conditions of moral and related, widespread intellectual decay. These were, conditions which were already widespread, as an infection, within the science-environment of that time, and which have become far worse today. Within that lapse of time, prudence often impelled Gauss, then, out of an understandable sense of personal discretion, to hold back some among the most significant, controversial features underly-

1. The period from Napoleon Bonaparte's installation as Emperor onwards was a time of a deep and widespread cultural decadence, called Romanticism. Romanticism's influence as a form of corruption infecting newborn generations of prominent figures of science and artistic composition and its performance, is typified by the influence of the corrupt Augustin Cauchy in physical science, and Liszt and Richard Wagner in music. See Heinrich Heine on the subject of the Romantic School, for an example of the problem.



EIRNS

A LYM "basement" team, working outdoors on Gauss and the orbit of Ceres.

ing many among his leading discoveries: where my native, more militant disposition, for example, would not have permitted me to do so.

I have repeatedly warned those LYM members, and others who have been assembled for sundry phases of this mission, that they must ask themselves: *What were those hidden features to which I now allude, again, and why was Gauss committed to suppressing certain among the relevant, underlying facts about his own discoveries? What is the difference between the method Gauss actually employed for his discoveries, and his method of presenting the proof of that which he had achieved with such justified pride? Why is there such a difference, why such a gap?*

This has been repeatedly, as presently, a subject of my continuing discussions with the LYM teams, a subject which must be shared more widely, as now. In this second response to the LYM's contribution to the *Festschrift*, I focus on the still deeper implication which must be considered if the crucial error in most contemporary mathematics education is to be remedied.

The source of the problem lay not in Gauss himself, but in the corrupted, Liberalism-infected state of mind of most among the audience to which virtually all of among his discoveries were presented for publication in those times. What is the crucial conception which must be introduced, to free science, finally, from that corrupting grip of Liberalism which has pushed global civilization now, to the brink of a generations-long, planetary new dark age today?

It is to be emphasized on this account, that Anglo-Dutch Liberalism, as a philosophy, was an adopted ideology of the

Paolo Sarpi who adopted the medieval irrationalism of William of Ockham as the model for what has become the prevalent, modern European Liberalism of both classroom and law-making today. The intent of Sarpi and his slime-ball style in-house lackey, Galileo, was to permit innovations, despite the rabidly pro-feudalist, Aristotelean conservatives, but to eliminate knowledge of actual scientific principles, by substituting mere algebraic formulas for knowledge of principles.

As the customary fraudulent, academics' attacks on Kepler and Leibniz attest, no actual physical principle, such as those of Cusa, Kepler, Fermat, or Leibniz, has been tolerated by these Liberals, to the present day. The silly fraud which the Newton faction, including D'Alembert, Euler, Lagrange, and Cauchy presented as a calculus, is typical of the Liberal practice of substituting sentimental, Sophists' slop, in the

form of merely descriptive language, for actual knowledge of science.

Reading Gauss

That just-stated fact of the matter is illustrated by the exemplary case of Gauss's reference to his own earlier discovery of an anti-Euclidean mode in physical geometry.² As I have warned the LYM teams repeatedly, the Gauss living under the political conditions menacing early Nineteenth Century science, often chose to present his discoveries *without taking the political risk* of fully uncovering the actual method by which he had achieved them; this is the case even some among his most notable discoveries.

As I have written, repeatedly, earlier, in such cases, as the LYM has met this problem frequently in its work, we may discover, at later points in Gauss's work, that, often, his explanation of the discovery, which, although an accurate description of the result itself, omitted accounting for certain crucial features of the means which he had actually employed for those publicly reported achievements.³ The sometimes heated quality of the correspondence between Gauss and Jónas and Farkas Bolyai, son and father (and others), on the subject of non-Euclidean geometry, merely exemplifies the kind of challenge

2. C.F. Gauss to C.L. Gerling, Feb. 14, 1832: in Kurt-R. Biermann, *Carl Friedrich Gauss: Der "Fürst der Mathematiker" in Briefen und Gesprächen* (Munich: Verlag C.H. Beck, 1990), pp. 27, 137.

3. Typical is Gauss's treatment of his argument against the empiricists in the matter of the Fundamental Theorem of Algebra, and the related matter of quadratic reciprocity. See note, below.

which those who would be serious students of Gauss, must, repeatedly, face and resolve in their own minds.⁴

That kind of challenge to today's student, was not manifest in that problematic form, in the written reports of their own work by such predecessors of Gauss such as Kepler and Leibniz. Kepler hides nothing in providing the student frank identification of earlier assumptions he has discarded. It is also notable, that Gauss's follower Bernhard Riemann, was to be much franker than Gauss about the method of his own discovery, where Gauss had often been cautious on comparable points.⁵

On that occasion, I cautioned the LYM team, that, therefore, before jumping, prematurely, to what might appear to be obvious conclusions, they must concentrate on digging deeply into the virtual map of the way in which Gauss's mind actually worked on the Ceres project, and, also, in work on other subjects treated by him at later times. For that reason, I have warned the LYM team, earlier, that their special challenge in this case would be, that although Gauss provided his readers with a description of the results of his discoveries, such as the Ceres orbit, their task would be to seek out the pattern of evidence which underlies the outlook and method which Gauss had actually employed for the process in certain among his crucial discoveries, such as, already, in the case of the discovery of the orbit of Ceres.

So, I have already warned the present reader, that in a comparable sort of case, there is often a crucial difference between the acceptable quality of the honest explanation which a manufacturer might provide the professional employing that manufacturer's product, and the different, deeper nature of the scientist's duty of informing both his colleagues, and future generations, of the method by which the discovery had been actually generated. The requirement of reports on discovery of principles of science, is providing other scientists, or students in science, with *re-experiencing* that relevant quality of experience of the *the act* which corresponds adequately, on account of principle, to an exact description of the actual quality of experienced mental process by which the product's crucially relevant features had been discovered.

In science: if you, as student, for example, have not replicated what I shall clarify here, as the relevant act of specifying the parameters of design required for the relevant proof-of-principle experiment, you, like most who have been trained scientifically in the empiricist or positivist schools, do not actually know, yet, what you are talking about.

4. *Loc. cit.* There was, and remains, a fundamental difference in principle between the Riemannian *anti-Euclidean* geometry which was the impulse of Gauss's teacher Abraham Kästner, and the modified form of Euclidean geometry typified by the work of Lobatchevski and Jónas Bolyai. As Albert Einstein was to emphasize, Riemannian physical geometry was already implicit in the principal discoveries of Kepler, and also, as Einstein would probably have concurred, in Cardinal Nicholas of Cusa's *De Docta Ignorantia*.

5. As in the opening two paragraphs of Riemann's 1854 habilitation dissertation.

'Quadratic Reciprocity' Again

This set of considerations obliges us to turn our attention to the most profound of the issues of the method required for scientific progress in general. On this present occasion, I take a broad step which is similar to what I have published on similar matters earlier, but is nonetheless a qualitative, and also necessary step beyond what I have presented in related matters on which I have written earlier.

From the work of the ancient Pythagoreans and Plato, through the crucial discoveries, as by Nicholas of Cusa, Leonardo da Vinci, Kepler, and Leibniz, as capped, thus far, by that of Riemann, Einstein, and Vernadsky, all actually competent insight into crucial matters of science, as since the design of the great pyramid of Giza, is always to be rooted implicitly in the subject of astrophysics. There is nothing merely coincidental in that choice; the choice is unavoidable. For those among us who are thinking clearly today, those relevant, better-known ancients, such as the Pythagoreans and Plato, used the concept of the "universal" to signify either the notion of the entire existence of the known, stellar universe, or a physical principle which could be implicitly attributed, pervasively, to be, functionally, a metrical characteristic of the whole interior of the domain of that universe, so defined.

At first impression, the starry universe appears to be spherical. Why is that so? Does that appearance not imply that a quality of "sphericalness" bounds the universe? If so, does something else, of a still higher epistemological authority, bound that apparently spherical quality of boundedness? These are not merely coincidental questions, but profoundly ontological questions to be treated by appropriate methods of investigation; these questions imply a different question of deadly seriousness: *How was this stubbornly persistent appearance of spherical boundedness, as by the Pythagoreans and Plato, generated for the mind of man?*

Two great questions are implied in that set of questions. *The first of these questions*, is expressed in the form of the elementary notion of an anti-Euclidean geometry of the type underlying the physical science of the Pythagoreans and of the related circles of Socrates and Plato. *The second, deeper question, which is also implied in certain features of their work, as also the famous argument of Heraclitus earlier*, is: *to what degree is the way in which we acquire reliable scientific knowledge, itself a reflection of the "systemic architecture" of what appear to be the specifically human biological conditions under which all valid human knowledge of the universe is organized?*⁶

Thus, Kepler's uniquely irreplaceable, original discovery of the principle of universal gravitation, has continued, in fact, to typify the proper modern use of the term "universal" to the present time.

6. Compare this to my earlier emphasis on the fact of the way in which the biological design of the functions of the human mind define the way in which the "architecture" of the imagination is designed.



New York Public Library

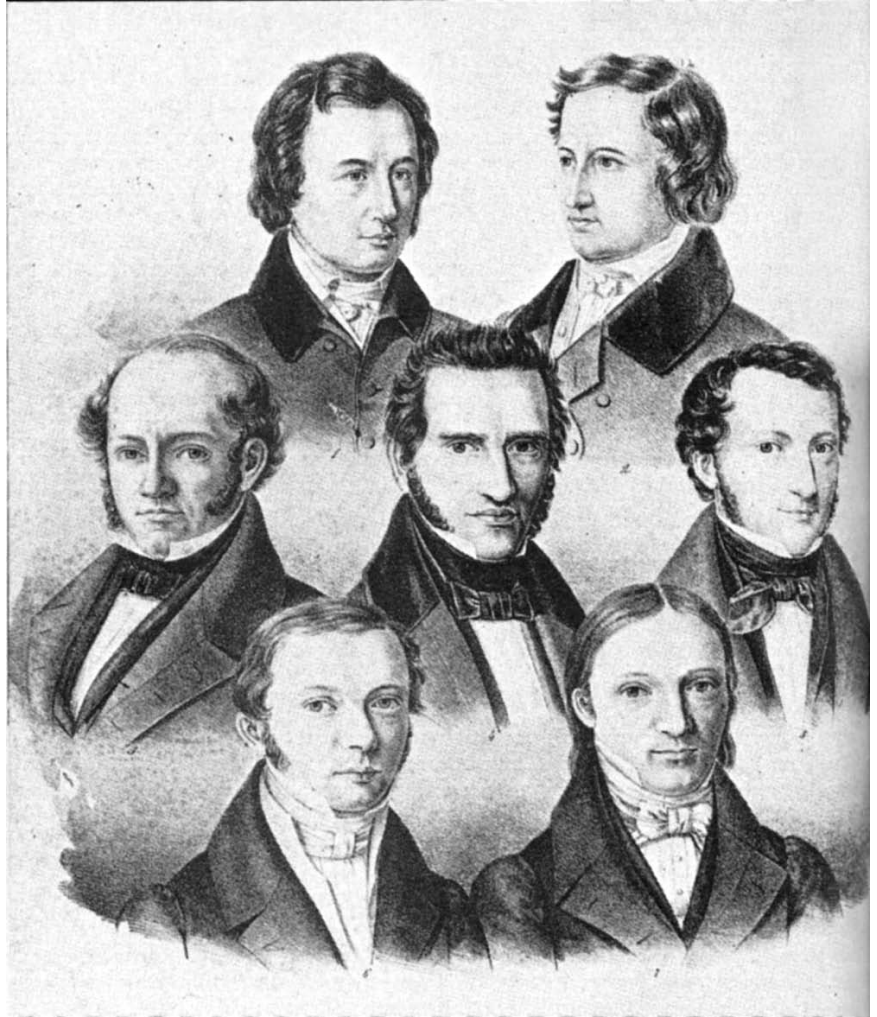
Carl Friedrich Gauss (1777-1855) was working in a hostile political and cultural environment, shaped by the Napoleonic wars and the regime of Prince Metternich, which limited Gauss's openness in presenting his own ideas and the scientific method he used.

In the course of time, one member of the team working on Gauss's discovery of the Ceres orbit brought up the matter of Gauss's ominous remarks on the subject of *quadratic reciprocity*. Gauss's emphasis on that matter should have startled the reflective scientist; it startled the LYM team. Thinking, hours later than the discussion which that question had first provoked, I was delighted! At the next opportunity to present my case, on the following morning, I presented the team my thoughts in explanation of Gauss's remarks. I also presented them with a footnote I had prepared the previous evening for intended publication in a major paper of mine in progress of completion at that time. This bears on a crucial feature of Vernadsky's *On the States of Physical Space*.⁷

That observation, on quadratic reciprocity, typifies, exactly, the distinction to be made between Gauss's actual method of discovery, and the frequent manner in which he not only presented, but defended his actual discovery later. I am as gratified as a "proud papa" by what that LYM team itself has done, actually independently of my explicit direction, to that effect.

Here, I go a qualitative step further.

7. See Section I:13 of this Vernadsky work itself, also the entirety of Section II. A provisional English translation of this 1938 Vernadsky paper was presented as part of the *Festschrift* for my 85th birthday.



In 1837, a group of Göttingen professors, including Gauss's collaborator, Wilhelm Weber, publicly protested changes in the state constitution by the new king, and were expelled from the University. The Göttingen Seven, as they became known were top row: Wilhelm Grimm, Jacob Grimm; middle row: Wilhelm Eduard Albrecht, Friedrich Christoph Dahlmann, Georg Gottfried Gervinus; bottom row: Wilhelm Eduard Weber and Heinrich Georg August Ewald.

Kurt Gödel's Paradox

As I emphasized in the referenced location, the general implication of Gauss's famous remark on quadratic reciprocity, is a reference to the fact that we humans are a very special type of species among living processes; this implication points attention to the underlying fact of the way in which we must envision the means by which our living physical organization carries within each of us, a certain set of what might be regarded, for purposes of pedagogical exercises, as deep, quasi-axiomatic-like, *functional* characteristics of an implicitly creative quality, characteristics so expressed, uniquely, by the well-developed individual human mind. These characteristics express, in themselves, the conceptual powers associated with our ability to form experimentally validated conceptions of the lawful characteristics of our universe.

This, for example, as I have stated before, is a relevant,



Kurt Gödel (left) with Albert Einstein. Gödel's work demolished the systemic flaw behind Bertrand Russell's *Principia Mathematica*, a revered example of modern European Liberalism in the classroom, which substituted algebraic formulas for knowledge of principles.

much deeper implication of Kurt Gödel's famous work exposing the systemic fallacies, viciously and fundamentally permeating Bertrand Russell's *Principia Mathematica*.⁸ This time, I carry the argument to a qualitatively deeper level than I did, recently, in my earlier presentation of this notion of method.

In that earlier location, I had emphasized the point, that the sensory-cognitive composition of what are, combined, the mental organization of the individual human mind, imposes a certain functional view of our experienced universe, a view impressed upon the cultivated form of development of a human mind. This form of organization of the human mind, includes that expansion of human knowledge of our universe which is represented by each experimentally validatable discovery of a universal physical principle. Hence, the validity of the principle which Kurt Gödel proved against Bertrand Russell, Norbert Wiener, John von Neumann, et al.

Now, in this present location, I take that same subject-matter to its qualitatively deeper implications. I emphasize my own experience in countering the pathological way in which secondary and higher education in physical-science matters has been conducted within customary practice of modern European Liberalism. In other words, it is often through the diagnosis of a mental illness, that sanity is better defined as a matter of principle.

8. Lyndon H. LaRouche, Jr., "The State of Our Union: The End of Our Delusion," *EIR*, Aug. 31, 2007. See note 42, p. 37.

As a matter of a relevant bit from my own biography, I had always despised the customary form of secondary education in Euclidean geometry. That is to say, from about the first moment, during my adolescence, I had encountered it. That dislike, with its accompanying theological implications, turned out to be, later, over the years, one of my most important, most crucial personal intellectual achievements, respecting the benefits this would produce in my progress during that and later decades of my life's work.

The crucial point so located, is: A priori presumptions, as typified by the Sophist's hoax known as the definitions, axioms, and postulates of a so-called Euclidean geometry, are to be recognized by the attentive mind, as the very essence of formalist types of that school of Sophistry to which Euclid himself adhered. Whoever clings to Euclidean or kindred assumptions, has thus crippled, if not ruined, what would have been, otherwise, his or her ability to think clearly about the most crucial qualities of scientific and other matters.

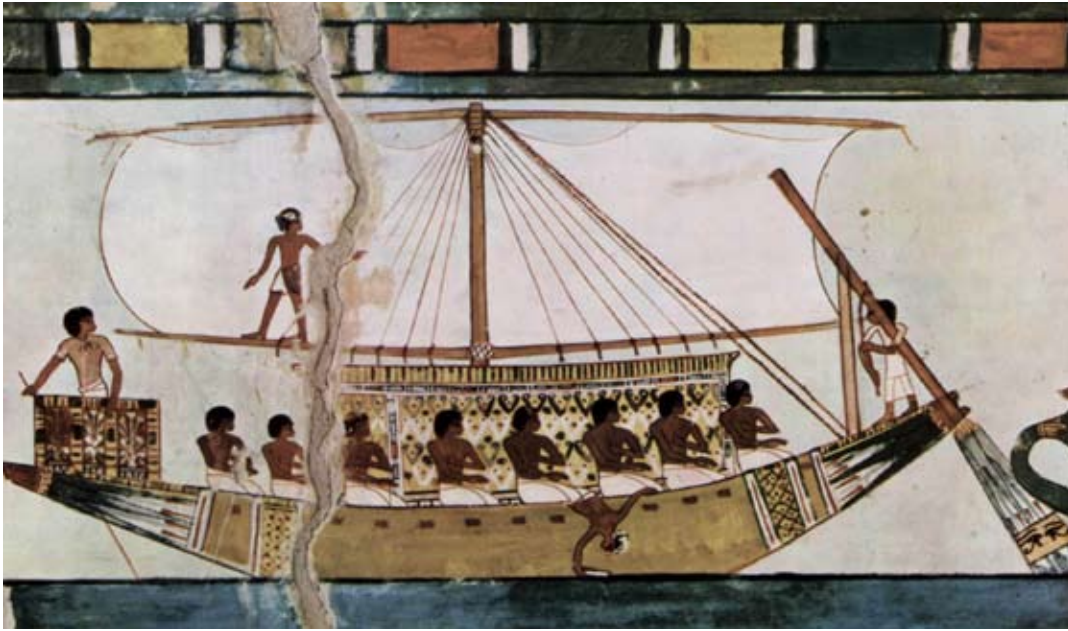
The fact is, that virtually all of the generally accepted academic standards for pre-scientific and related education in schools and universities still today, are premised on assumptions typified by what is fairly described as a pro-Newtonian dogma. This is, typically, a dogma expressed in the typical secondary and university undergraduate programs which order the foundations of education in science upon the succession of Euclid; Cartesian ("Analytical" geometry) built upon Euclidean-like premises; an elementary differential calculus premised on the ontological presumptions of Cartesian geometry; and, a notion of an integral calculus, and differential equations, etc., premised upon that logical-deductive sequence.

The result tends to resemble a state of fried, scrambled academic eggs, or a journey to a strange underworld, from which few travelling minds return.

On the other hand, a contrary, valid form of primitive scientific method would have rejected the notion of the functionally ontological existence of a Euclidean, or Cartesian, "four-square" space. All competent mathematical thinking proceeds, initially, primarily, from spherical functions such as those familiar from the work of the Pythagoreans, Plato, et al. Physical space-time is then located "outside" a spherical universe, but in a special way. Spherical space is the virtual screen on which our notion of events in physical space is projected. As Kepler's discovery of gravitation illustrates the point, afresh, most clearly; it is "perturbations" of the simply spherical ordering,⁹ which are the elementary subject-matter of the Pythagoreans' Sphaerics, and of the circles of Socrates, Plato, et al.

What, then, is the result of scrapping the traditionally reductionist approach, beginning with the dumping of Euclidean geometry, to the standard modern mathematical stock-in-

9. Such as the role of the equant in Kepler's defining the Earth orbit, and the recognition that harmonical principles define the ordering of universal gravitation's action within the Solar System.



The dominant cultures of mankind were maritime, spreading their ideas across the oceans. Here, a painting of an ancient Egyptian ship, ca. 1450 B.C., from the tomb of Menna.

trade? What is the required change in approach? What is the crucially underlying difference between the two?

Sphaerics: A Discussion

Our present knowledge of the development of competent currents of science within European civilization since approximately 700 B.C., has been centered in two great revolutions.¹⁰ The first, whose roots are located in that practice of *Sphaerics* which the Pythagoreans adopted from Egyptian legacies, was extended from the work of such as Thales and Heracleitus, through the circles of Socrates and Plato. The second, was a renaissance of science, on the foundations left by the Pythagoreans, Plato, et al., by Cardinal Nicholas of Cusa and his followers, who freed modern science from the relative hegemony of those forms of moral and intellectual decadence brought about under the reign of the Roman, Byzantine, and medieval Crusader system of usury.¹¹

The hegemonic expression of modern decadence in science, has been the rise, since about 1689, of great financial and political power of a form of imperialism known as the

10. The beginning of the known civilization in which Classical Greece is to be located, is the emergence from an earlier dark age, dated from approximately 700 B.C. The dating is associated, functionally, with the estimated point of the alliances of Egypt with the Etruscan and Ionian maritime capabilities, against Tyre and Carthage.

11. Although the heritage of the Pythagoreans and Plato continued through the deaths of Eratosthenes and Archimedes, most notably, that earlier phase of European science was reborn, in essentials, with the work of Cardinal Nicholas of Cusa et al. from a point circa A.D. 1439. The connections, as through the great Baghdad Caliphate, are notable, and also important, but the relationship between the Classical Greek and modern Renaissance is essentially a matter of parallels.

Anglo-Dutch philosophical Liberalism of the followers of Paolo Sarpi and his lackey and hoaxster, Galileo Galilei, and such among the typical followers of Sarpi and Galileo as René Descartes. It is the neo-Euclidean scheme of Descartes, which best typifies the intellectual and moral corruption permeating most modern teaching of mathematics and its application for scientific education and its related bodies of popular and other opinion.

For about 200,000 years preceding the great melt of about 17,000-2000 B.C., the dominant cultures of mankind were maritime cultures. These maritime cultures colonized the coastal areas near the mouths of great rivers and similarly suitable locations, defending these colonies against the relatively more brutish, more sparsely populated cultures of the interior. The colonization of southern Mesopotamia by a non-Semitic, maritime-based culture of the Indian Ocean region, is merely typical. A sea-borne spread of ideas, through aid of maritime colonizations and commerce, was the driving force of both physical economy and ideas. Cultural progress spread across oceans and seas, and up-river along the course of principal rivers.

Land-locked culture tended toward the cultural stagnation inherent in the monotonous tradition of the small plot. In contrast, the legacy of the recent 200,000 or more years of vast glaciation prior to approximately 17,000 B.C., located the cultural potential for survival and growth of human progress, which was implicit in the emergence of transoceanic maritime cultures internally organized around the concepts of astrogration expressed in terms of the Zodiac. This legacy of 200,000 and more years of the hegemony of a maritime culture rooted in astrogration, suffices to account for the seeds and kindred origins of the scientific and economic development of the

leading currents of human cultural progress which confront us in the Mediterranean origins of the European civilization which emerged from its preceding, centuries-long interval of a dark age preceding the rise of what we know as the historical Greek civilization, which emerged from the mists of Homeric epics.

This view of the historically known roots of European cultural development does not deny the earlier developments on which post-700 B.C. development depended. Rather, we are to understand what is known, factually, of earlier developments, as that which is to be recognized as expressed, implicitly, within, and by the European developments of the recent 2,800 years.

Thus, the span of mankind's successful existence leading into the present, has always been seen wisely in the spherical astronomical view of the Heavens of a Zodiac, an image which has been a reflection of the development of transoceanic maritime cultures.¹² Our best insight into that arrangement is seen, from about 700 B.C. onward, in the rise of the relationship among an Egyptian, Etruscan, and Ionian-Greek civilization, united against Tyre, and pivoted on the maritime axis of Cyrenaica's temple of Ammon-Ra.

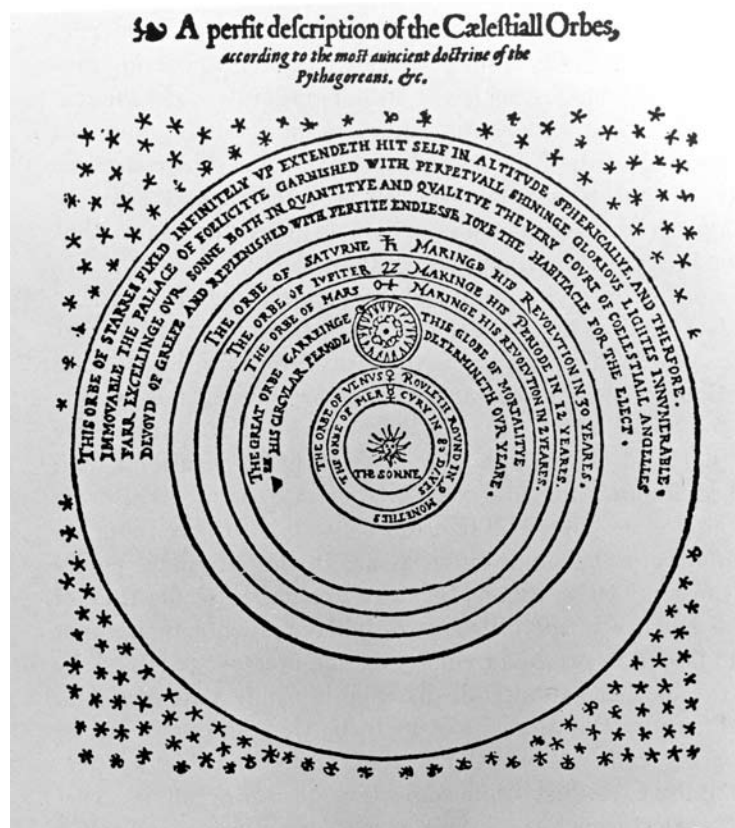
Here lies the essential root of modern European civilization, as expressed by that Egyptian notion of *Sphaerics* which is central to the accomplishments of the Pythagoreans and their associates of the circles of Socrates and Plato.

Contrary to the hoaxes known, respectively, as Euclidean or Cartesian geometries, man's primary knowledge of the organization which underlies the apparent organization of motion within our apparently starry universe, is as a starry sphere. Therefore, science was expressed by the relevant Egyptians, as echoes of the great oceanic navigator's view of an unbounded universe in the form of a vast sphere. This is the implicit forerunner of the common universal outlook of Bernhard Riemann and Albert Einstein: a finite but "unbounded" universe, a universe implicitly expressed in the form of such a hypothetical sphere. Hence, *Sphaerics*: what underlies those actions which violate the perception of a simply spherical universality?

Dynamics

Thus, instead of the silliness of the cults of Euclidean or Cartesian geometries, all competent mathematics, or mathe-

12. Probably, the time required to sail from the coast of Morocco to the West Indies during a time prior to 17,000 B.C. would be about the same as Columbus's first such voyage. Ancient astronomical calendars dating from long prior to 700 B.C. indicate that such voyages were a more or less commonplace feature of the long spans of history during the two hundred millennia prior to A.D. 1492. With the opening of both the Mediterranean to the Atlantic, and the salt-water takeover of the Black Sea, the same traditional sailing routes, southward to the Caribbean, and northward back to Europe, must have been "not uncommon."



Ancient cultures had a spherical view of the heavens, observing the passage of the stars across a hemisphere above. Here, a 1576 depiction of "The Celestial Orbes, according to the most ancient doctrine of the Pythagoreans, etc.," by Thomas Digges.

tical physics, is based on the notion of spherical functions as primary, as "elementary." Any phenomenon which expresses an ordering principle more than this, must be recognized as a *meaningful qualitative variation* from the simply spherical. In modern mathematical physics, this was made clear by the Johannes Kepler whose discovery of the principle of gravitation as ordering the Solar System, is the actual foundation of all competent systemic expressions of modern European physical science. Thus, we define the universe as expressed, firstly, in the primitive form of a spherical function, but must, then, recognize the existence of any efficient principle which is expressed as an apparent violation of the bounds of a simply spherical function.

This higher order of physical geometry, an order expressed by universal physical principles, such as gravitation, is the domain of *dynamics*, as Leibniz revived the ancient Pythagorean-Platonic conception of *dynamics* for modern physical science. All competent science today, including any attempted science of economy, is, for example, a subject of Riemannian dynamics.

Our universe is organized under confining universal physical principles which lie beyond the reach of a merely spherical universal order, in higher, implicitly Riemannian

physical geometries. It is the perturbations which such principles provoke in an otherwise apparent spherical universal ordering, which are the subject-matters which define physical science. The notion of such a Riemannian universe, as governed by such supra-spherical principles of Leibnizian dynamics, forms the proper basis for a calculus of mathematical physics. All significant functions experienced in reality, are subsumed, implicitly, by this notion of Riemannian dynamics, as the outgrowth of Leibniz's revival of the concept of dynamics as the only competent basis for a calculus of the complex domain.

That distinction is most plainly expressed, in the history of modern European science, by Leibniz's grasp of the significance of Fermat's paradoxical principle of *physical least action*, a discovery which, in the hands of Leibniz (and Jean Bernoulli), overturned the simplistic notion of least action (as by Christiaan Huyghens), of the cycloid, by the catenary-cued, universal principle of physical least action.

In the history of the modern European physical science founded by Nicholas of Cusa's *De Docta Ignorantia*, it is Johannes Kepler who, with his notion of the lawfully harmonic composition of the Solar System, founded all competent modern science according to the principles elaborated earlier by Cusa. Kepler introduced the concept of modern mathematical-physical dynamics with his discovery of a manifested principle, the harmonic composition of the Solar System, which is the first general principle of physical science underlying all competent forms of modern physical science.

The outcome of any disregard for those considerations of Kepler-Riemann physical science, is, that the usual teaching of mathematics and physics in secondary schools and undergraduate university programs turns everything upside-down and backwards. Instead of defining mathematical physics as derived, successively, from the wild-eyed infantilisms of Euclid and Descartes, followed by the crude differential calculus of Cauchy, and, then, higher forms of calculus and number-theoretical notions, we must start as the Pythagoreans learned from the Egyptians, from the starting-point, located within *Sphaerics*, which the ancient Pythagoreans and Plato defined as *dynamis*, the term translated by Leibniz as *dynamics*.

The modern *Sphaerics* is defined, essentially, by the successive work of Cusa and Kepler. Kepler's prescription for the calculus and the treatment of spherical functions, which Kepler relegated to the mission performed by his successors, is the only competent ordering of the study of modern scientific practice. As Albert Einstein emphasized, all competent modern physical science is expressed by the developments, rooted in the discoveries of Kepler, which are expressed in Riemannian hypergeometry. Throw away Euclid; junk the foolish Descartes; scrap all mathematical-physical dogma which proceeds from any root but that of the doctrine of spherical functions (modern *Sphaerics*) presented, as a starting-point, by Kepler's work.

Kepler's Infinitesimal

Thus, as I have just restated this point: All competent modern physical science is premised on Kepler's original discovery of the universal physical principle of gravitation, a notion of universal physical principle which Kepler himself traced, explicitly, to the work of Cardinal Nicholas of Cusa, and such explicit followers of Cusa as Luca Pacioli and Leonardo da Vinci. The great fraud permeating most teaching of what passes for modern science, has been a product of the *empiricist* form of *Sophist* doctrine of philosophical Liberalism which was introduced by Paolo Sarpi, a dogma which Sarpi premised upon the medieval lunatic William of Ockham, the dogma known as *Anglo-Dutch Liberalism* today. Cartesianism is the most typical outgrowth of the empiricist dogma of Sarpi, Galileo, and such followers as Hooke, Locke, and Descartes.

This point is aptly illustrated by a glance at the typically incompetent methods of financial-economic forecasting associated with the methods employed under that U.S. Federal Reserve Chairman Alan Greenspan, the Greenspan who served as the principal U.S. architect of the great monetary-financial catastrophe descending upon our planet as a whole today. Typical of the relevant mental disorder, are the rabidly reductionist methods of forecasting employed by LTCM's Myron Scholes, the same methods expressed by the wild-eyed rampage of what has now become the rampaging collapse of the world's great hedge-fund bubble now.¹³

The development of anti-Cartesian modern *dynamics* by Gottfried Leibniz, was considered by the imperialist Liberals of the Anglo-Dutch Liberal faction as the greatest threat to the neo-Venetian form of imperial monetarist usury, the form of usury which must now be destroyed, if civilization is to continue, anywhere on this planet, during the months and years now just ahead.

However, there are certain crucial complications; these may be treated, summarily, as follows.

First, as I have emphasized in my August 29, 2007 *Music & Statecraft: How Space Is Organized*,¹⁴ human mental sense-perception is usually defined primarily, chiefly, in terms of the contradictory experience of vision and hearing, as Kepler's discovery of the general principal of Solar gravitation illustrates the point. In fact, the mutually contradictory experience of all of the relevant senses employed in a particular experience, define the "dimensionality" of the relatively immediate experience of physical space-time. The universal physical principles expressed within that framework of sense-experience, rather than either visual or auditory space, define the proximate reality of knowledge relevant to sensory experience.

13. Ironically, a feature inhabiting what are known as the islands of the imperial caymans.

14. *EIR*, Sept. 14, 2007.



LYM members in Boston demonstrate the least action principle of the catenary chain, as Bruce Director (center) looks on. LaRouche writes: "The notion of the infinitesimal, as it appears in the central discovery of principle by Kepler; and as the ontologically defined, efficient infinitesimal of the Leibniz-Bernoulli, catenary-cued principle of universal physical least-action, implicitly defines the universe for us..."

EIRNS

Thus, as I have emphasized in discussion of this matter in recent, earlier locations, this is key to a more adequate comprehension of the implications of Kurt Gödel's 1931 *On Formally Undecidable Propositions of Principia Mathematica and Related Systems*.¹⁵ On the first level of approximation, the essential gap within the failed attempts by Russell et al., is that a universe in which life and human creative mentation exist can not be a closed system of the type which Russell's assertion demanded. The universe is not numerical; the universe is not merely physical-geometric in the sense of its elementarity, but also its susceptibility of creative cognitive, systemically anti-entropic, development of its essential principle. *In short: as Einstein and Vernadsky insist, the universe is Riemannian.* We must therefore approach the universe in its wholeness as primary, rather than in terms of dubiously presumed elementarities of the finite, ontologically small.

Hence, the actual origin of the "incompleteness" which pops up to the surface in Gödel's referenced and related work.

Thus, although we must reference experience to that notion of sensory interactions, rather than a single quality of

15. *Kurt Gödel Collected Works*, Vol. I, 1929-1936 (Oxford: Oxford University Press, 1986). From the standpoint of epistemology, Gödel's great achievement in this work is a startling anomaly. Although his most celebrated work is located in the legacies of the Georg Cantor of the 1880s (prior to the outbreak of a persecuted Cantor's clinical insanity in the 1890s) and David Hilbert, the ontological implications of his achievement in that famous paper, are actually located within the contrary epistemological domain of Bernhard Riemann.

sense-perception, it is the product of that multi-sensed view of our experience which informs our useful view of events within the frame of reference of functional spherical space. That provides us the general perspective on the notion of physical space-time.

However, that is not the end of the matter. As man's ability to discover and employ universal physical principles informs us, we do not live within a fixed ordering of the universe. The universe which we human beings know, is *anti-entropic*. Not only do discovered universal physical principles exist; the human aptitude for more advanced discoveries, is an active principle of the universe which we occupy, and which we, thus, to a large degree of approximation, may define.

Here lies the deepest implication of Kurt Gödel's exposure of the hoax in not only Bertrand Russell's *Principia Mathematica*, but the incompetence of all devotees of Russell's argument, such as Professor Norbert Wiener, John von Neumann, their neo-Malthusian and other followers today.

That refutation of Russell's argument, is the implicit principle of Riemannian physical space-time.

In my earlier summary of the argument for this notion of incompleteness, I emphasized the intrinsically *noëtic* qualities of the individual's cognitive processes; here, I add insistence on the intrinsically *noëtic* principle of the universe as a whole, within itself: in other words, the human individual as a typical being of the universe as a whole, which might be compared to the notion of man as in the likeness of the Creator, *Promethean man*.

From the Top, Down

Reading the work of Nicholas of Cusa's followers Leonardo da Vinci and Johannes Kepler, and such among Kepler's followers as Fermat, Leibniz, and Riemann in this light, Kepler's organization of the Solar System, as expressed in terms of the harmonics of the system, rightly leads us to trace all of the competent development of the notion of the essentially principled character of modern physical science as Albert Einstein treated Kepler. This works to the following notable effect.

Instead of developing mathematics according to a sequence of stages such as Euclid, Descartes, and Euler-Lagrange-Cauchy, we recognize Kepler's disturbing of the simple notion of spherical physical space-time by the principle of harmonically ordered gravitation as the foundation of all competent modern physical science. The notion of the infinitesimal, as it appears in the central discovery of principle by Kepler, and as the ontologically defined, efficient infinitesimal of the Leibniz-Bernouilli, catenary-cued principle of universal physical least-action, implicitly defines the universe for us, as Riemann defines this in essential respects.

On this account, modern science starts with modern *Sphaerics*, in which the central notion is the concept of the *infinitesimal* central to Kepler's discoveries. This infinitesimal, so defined, is located within the universal as a whole, thus defining the physical universe as approximately elliptical, rather than spherical, leading thus to the Riemannian notion of higher hypergeometries.

To accomplish this, we throw away Euclid, Descartes, Euler, Lagrange, Cauchy, Clausius, Grassmann, Kelvin, et al. We treat Kepler as defining the implications of *Sphaerics*, and treat efficient action as located thus. We proceed then, as if from Kepler, Fermat, and Leibniz's *dynamics*, through the implications of Gauss's contributions to the work of Riemann and Riemann's followers. Empty the rubbish-barrel of Sophistry, and throw away that barrel itself. The work of Einstein's and Vernadsky's contributions to the realization of the implications of Riemann's discoveries serves as the foundation of everything we actually, presently know—in the epistemological sense.

Viewing the role of the human individual mind within the universe so defined, what is our nature within this universe?

The virtually *a priori* universe we inhabit, is defined for us by what we are, functionally, in our universe. This pertains to both the way the paradoxical juxtaposition of our sense-organs' functioning defines a real world distinct from that of crude sense-certainty. However, since the human individual contains a manifest, principled form of power over "nature" lacking in all animal species, it is not sufficient to recognize the way in which our biological organization determines the axiomatic features of the way we define physical science, and related matters. We are also distinct from all other living creatures in respect to the creative powers which separate us from the beasts.

There, in those higher powers which distinguish us as a species, lies the faculty of the true scientific method through which we are uniquely equipped, differing thus from other living species. Our knowledge of scientific principles lies in that special quality we express as members of a human species. There, precisely here, lies the essence of scientific method.

Review the question, "What are we?," afresh, from that standpoint. Earlier, I have proposed that we see ourselves as delimited by fascination with our biological existence, rather than adducing our biological existence as something which is

Expunge reductionism! Put Euclid into the rubbish-bin. . . . "Let the dead bury the dead."

adumbrated by a higher order of universal principle. Now, take the next step: see ourselves as creatures which express our true nature as located within the central, self-creative principle (the self-subsisting principle) of the universe itself.

Then, instead of merely compensating for our dependency on the biological setting of our cognitive potentials, we must now see our existence in those qualitatively higher terms expressed by the question: *What is the nature of the universe which our functioning existence expresses?*

In my preceding account, I located mankind in the efficient role of our biological existence, and laid the emphasis on sensory-knowledge as the adumbration of the role of the faulty, but appropriate function of our mental-sensory apparatus.

Now, in this second pass, I have shifted the question onto a higher ontological level. In short, it is the prescience of an individual mind's original discovery of a new (anti-entropic) physical principle of the universe, which must be included as both a supplement to, and as superior to the function of the interaction of the senses. It is the whole nature of mankind, including that principle of creativity which is absent in the beasts, which defines the organism man, and, in this way, defines the principled properties which the creative individual human expresses as mankind's power in, and over the universe.

It is the apprehension of the efficient, if limited competence of our means for understanding this, which must make us wiser.

Expunge reductionism! Put Euclid into the rubbish-bin. Descartes is a nasty clown! Euler turned traitor to science, and Lagrange was his dupe. Cauchy was a plagiarist and hoaxster, and so were Clausius, Grassmann, Kelvin, and others of their ilk. As the Christian New Testament advises us, "Let the dead bury the dead."