ON VERNADSKY'S SPACE

More on Physical Space-Time

by Lyndon H. LaRouche, Jr.

September 13, 2007

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 remarks: as this effect upon me was probably intended by my relevant dear friends.*

One may 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 universe in which Gauss's thinking was located, remains poorly understood, even among professionals, still today.

The time came, when I was to meet with that LaRouche Youth Movement (LYM) team of volunteers which had been chosen by others, and 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, I emphasized, then, as now, is that Gauss, then, after the death of Abraham Kästner in 1800, as still later, was working within that hostile environment for European science which had been created by a succession of adverse circumstances. These were conditions shaped by both the Napoleonic wars and, under the regime of Prince Metternich and his like from the period of 1815 onwards.[1] Under those special, menacing political conditions, which were widespread in the science-environment of that time, prudence impelled Gauss, often, out of an understandable sense of discretion, to hold back some among the most significant, controversial features underlying many among his leading discoveries: where my native, outwardly militant disposition would not have permitted me to do so.

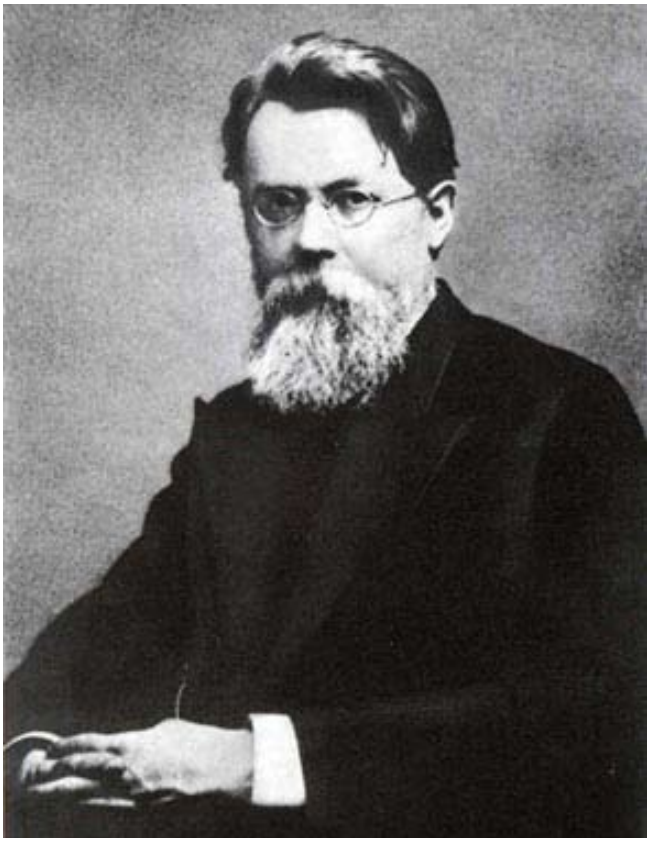
I warned those assembled for this mission, that they must ask themselves: *What were those hidden features, and why was Gauss committed to suppressing certain among the relevant, underlying facts about his own discoveries? What is the difference between the method Gauss employed for his discoveries,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

The source of the problem lay not in Gauss himself, but in the state of mind of most among the audience to which virtually all of his discoveries were presented for publication in those times.

That 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] 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 for some among his most notable discoveries. In such cases, his explanation of the discovery, which, although an accurate

1. The period from Napoleon Bonaparte's installation as Emperor onward 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.

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.



A birthday gift of an original translation of Vernadsky's On the States of Physical Space *inspired LaRouche to write this piece, in which he locates the crucial discoveries of the great Russian scientist in the tradition of the Pythagoreans and Plato.*

description of the result itself, often differed significantly from 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, typifies the kind of challenge which those who would be serious students of Gauss, must face and resolve.[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 predecessors of Gauss such as Kepler and Leibniz. It is also notable, that Gauss's follower Bernhard Riemann, was to be much franker about the method of his own discovery, where Gauss had often been cautious on this point.[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. I warned the LYM team 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 actual outlook and method which Gauss had employed for the actual process employed in certain among his crucial discoveries, such as, already, in the case of the discovery of the orbit of Ceres.

So, 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 *the act of experiencing* that relevant quality of experience which corresponds 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.

'Quadratic Reciprocity'

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.

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 science is always to be rooted in the subject of astrophysics. There is nothing merely coincidental in that choice. 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 characteristic of the whole interior of the domain of

3. Typical is Gauss's treatments 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.

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.

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 authority, bound that apparently spherical quality of boundedness? These are not merely coincidental questions; these questions imply a different question of deadly seriousness: How was this stubbornly persistent appearance of spherical boundedness 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 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 Heracleitus,* is, *to what degree is the way in which we acquire reliable scientific knowledge, itself a reflection of the "architecture" of what appear to be the specifically biological conditions under which all valid* ***human*** *knowledge of the universe is organized?*

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.

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, of the discussion which that question had 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***.[6]

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.

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

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Conditions imposed by the Napoleonic wars and the regime of Prince Metternich, impelled Gauss, "often, out of an understandable sense of discretion, to hold back some among the most significant, controversial features underlying many among his leading discoveries." The challenge LaRouche posed to a Youth Movement team was to discover those hidden features. Here, Gauss with his collaborator Wilhelm Weber.

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 a set of deep, quasi-axiomatic-like characteristics; 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, is a relevant, much deeper implication of Kurt Gödel's famous work exposing the systemic fallacies permeating Bertrand Russell's ***Principia Mathematica***.[7]

As a matter of a relevant bit of my own autobiography, 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 achievements, respecting the benefits this would produce in my progress during that and later decades of my life's work. *A priori* presumptions, as typified by the disgusting 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

6. 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.

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

EIRNS/Will Mederski

When a member of the team of LaRouche Youth Movement scientific explorers, working on Gauss's discovery of the Ceres orbit, raised a question about Gauss's concept of quadratic reciprocity, LaRouche reports he was as "delighted" as a "proud papa." Here, LYM members work on geometry, in Seattle.

types of the 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.

A valid form of primitive scientific method, rejects 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 are projected.

However, there are certain crucial complications.

First, as I have emphasized in my August 29, 2007 "Music & Statecraft: How Space Is Organized,"[8] human mental sense-perception is usually defined primarily in terms of the contradictory experience of vision and hearing, as Kepler's discovery of the general principle of Solar gravitation illustrates the point. In fact, the mutually contradictory 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.

Thus, although we must reference experience to that notion of sensory interactions, rather than a single quality of 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, and their neo-Malthusian and other followers today.

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

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 which 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.

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.

8. ***EIR***, Sept. 21, 2007.