ON THE NOËTIC PRINCIPLE

Vernadsky and Dirichlet's Principle

by Lyndon H. LaRouche, Jr.

May 18, 2005

The following is prompted by an examination of an implicitly accredited English translation of V.I. Vernadsky's 1935 ***On Some Fundamental Problems of Biogeochemistry,*** secured through the Columbia University files contributed by V.I. Vernadsky's son, Professor George Vernadsky, New Haven, Conn., U.S.A.

It is an often demonstrated fact of recent generations of European history, that certain victims of their classroom studies of Classical Greek, would have never understood any crucial concept of Plato's work, including the significance of the English term *Noëtic* as adopted from Academician V.I. Vernadsky's definition of the *Noösphere.*[1] The common source of the errors of all varieties of such failed former students of classroom Greek, and of many more others, still today, has been their disposition to look up definitions in dictionaries or by quoting so-called authorities, *rather than actually experiencing the relevant conception by replicating the original author's presentation of the process of generating the relevant discovery, as Vernadsky himself illustrated this method for acquiring knowledge of fundamental physical principles in the 1935 writing to which I refer here.*

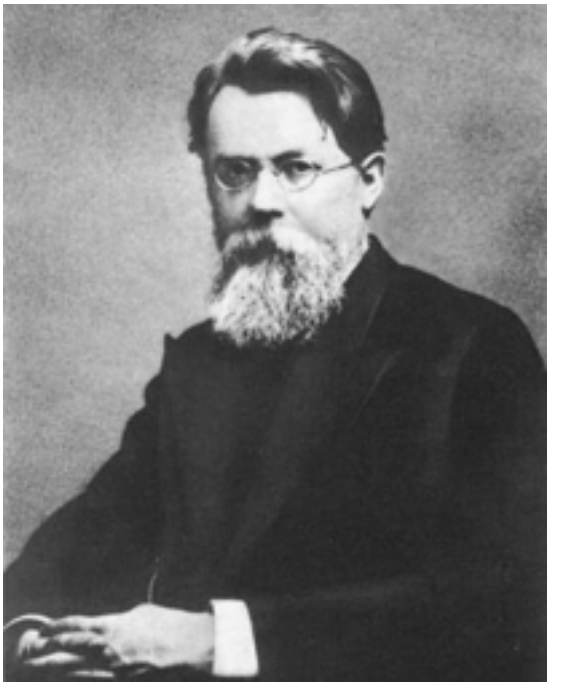
Such has been my experience of most of the putatively learned and other failed modern commentators on the argument presented by Vernadsky, or also by others on related subject matters.

Indeed, most of the crucial conceptions of valid science in globally extended European civilization today, are to be traced from their implied origin in the pre-Aristotelean Classical Greek, as from Thales and the Pythagoreans through the works of Plato. The conceptions of *Biosphere* and *Noösphere* developed by Academician Vernadsky, are a case in point. These conceptions, which Vernadsky associated with the Classical Greek tradition, could not be adequately understood except in those historical terms of reference to Plato's actually intended, non-reductionist usage of the Classical Greek for stating principles of discovery illustrated in the 1935 paper considered here.

What Plato actually refers to by such relevant terms, is to be known, not by reading a glossary, but by experiencing the actual act of discovery which solves the puzzle which Plato's argument presents in locations such as his pro-Heracleitus, ***Parmenides*** dialogue; only if the reader of that dialogue were a pedant, or a pompous fool such as G.W.F. Hegel, ignorant of the ABCs of the creative experience, would he have ever contested the authenticity of Plato's authorship of that dialogue.

The same point is illustrated by the appalling thick-headedness of Lagrange's attempted public refutation of that attack on his folly which had been delivered in Carl F. Gauss's 1799 dissertation. The point is also illustrated by the standard act of classroom stupidity imitated by those literally millions of victims, who, in the course of times past, have swallowed arch-reductionist Augustin Cauchy's epistemologically childish "limit theorem."

1. For example, the contrary meanings associated with Plato and Aristotle, respectively.



Writes LaRouche: "The characteristics of the Biosphere, as Vernadsky . . . defined it, and Noösphere, as I define physical economies as wholes, are analogous. Everything to which I have referred, on this account, in excerpting Vernadsky's 1935 paper, has a parallel in my methods of a science of physical economy." Left: R&D at Lockheed Martin Corp. for the International Thermonuclear Experimental Reactor—the energy source of the future. Right: Vladimir I. Vernadsky (1863-1945).

Over the decades since the fact of the existence of V.I. Vernadsky's work first became known to me, near the close of the 1940s, I, looking as if out of the corner of my eye, had come slowly to recognize that his most celebrated contributions had a certain potential relevance to my own independent discoveries in the field of a science of physical economy. That gradual recognition began more than fifty years ago, in the course of the continuing initial development of my own principled contributions. So, over decades, as more of his work came, as if piece by piece, gradually to my attention, I had come to recognize that he had already offered an overview which was compatible, in principle, with certain discoveries which I had experienced during the initial phases of development of my own Leibnizian notion of physical economy as such.[2]

As Vernadsky defines the guidelines for a biogeochemical investigation of the boundaries separating the biosphere categorically from the abiotic domain, I had, as I explain below, developed my own, somewhat parallel approach to this view, that in work in which I, working from my standpoint as an admirer of Leibniz, subsumed the principled distinctions separating the principle of human scientific creativity from both animal and abiotic modes of behavior. However, until some work which my association did during the mid-1970s, I made no significant effort to incorporate the Vernadsky legacy directly into our work on the principles of physical economy.

2. For those not yet familiar with these facts, an actually scientific conception of economic processes was originally discovered, and developed, as a science of physical economy, as a branch of physical science, a science needed to replace and supersede the then pre-existing modern doctrines of what was known as cameralism. On the record, this development was done exclusively by Gottfried Leibniz during the interval 1671-1716. It was the influence of Leibniz's discoveries which informed the crucial features of the development of that American System of political-economy which latter has been the chief rival and adversary of the British system, world wide, ever since. My own original discoveries, as a follower of Leibniz in this field, were developed by me, during 1948 and later, in continuing reaction against the radical reductionist follies of Norbert Wiener's argument for "information theory," in his 1948 ***Cybernetics.*** Over that interval of these original discoveries in the field of physical economy, 1948-1953, my adversarial targets had included the relevant work, on the founding of what became known as the "ivory tower" school of mathematical economics, of Bertrand Russell follower Wiener's co- thinker John von Neumann, as illustrated by von Neumann's and Oskar Morgenstern's ***Theory of Games and Economic Behavior.*** Von Neumann's posthumously published Yale lectures on the subject of ***The Computer and the Brain,*** are of crucial implicit significance in reading von Neumann's lunatic, long-winded argument respecting economy. On the record, my methods have been, contrary to the British school and its positivist fanatics, the most successful approach to long-range economic forecasting of the recent forty-odd years.

Lyndon LaRouche (left) lectures on April 28, 1994 at Pobisk Kuznetsov's "President" program, held at the Russian Academy of Sciences in Moscow. On the right, Dr. Kuznetsov in the audience. Writes LaRouche of Kuznetsov, who died in 2001: "I, like many who knew him and his work, miss him very much today."

Even those efforts of the 1970s touched Vernadsky's work in a passing, peripheral, if useful way.

It was only from 1994 on, through benefits of my associations with two now-departed Russian friends, the most remarkable Professor Taras Muranivsky and the scientist Pobisk Kuznetzov, among others, that I grew more confident of the existence of special, crucially important affinities between Academician Vernadsky's and my own lines of work in redefining a science of physical economy. The agreement, and some points of disagreement, in my own and Pobisk's views, were presented to a relevant Moscow scientific audience during that period.[3] In materials bearing on Vernadsky's work which were subsequently made available to me through some of my associates, I was convinced that I had sufficient evidence to draw out those connections between my own work and Vernadsky's which were featured in my 2001 ***The Economics of the Noösphere.***[4] The evidence then in hand was sufficient to have shown me that the problem implicitly resolved by his argument, as known to me then, was largely congruent with my own original discoveries in the field of a science of physical economy.

However, even then, during the late 1990s and beyond, while I was certain of the validity of Vernadsky's statement describing the central features of his stated notion of the Noösphere, I had yet to discover evidence satisfying me in respect to some important details of his approach to his original discovery of that conception.[5]

Recently, during the recent fortnight, a collaborator of

3. The debated issue on that occasion was on the definition of "energy." My host, Pobisk, began his lecture by defending the standard reductionist doctrine on that subject, and challenged me to define my principle of anti-entropy accordingly. In my turn, I opposed that definition of "energy" on that occasion, as many other occasions, before and after. The misguided suspicion in certain Soviet scientific insider circles studying my own original proposal for a strategic defense initiative had been that I had somehow acquired knowledge of super-secret Soviet work of the 1970s and 1980s, in which Pobisk had been involved, bearing on the scientific feasibility of such an initiative. I had no such knowledge of Soviet secret work, beyond my conviction that certain known lines in Soviet scientific work pointed to their ability to recognize the feasibility of developments along the lines I was proposing. Otherwise, Pobisk and I got along nicely. I, like many who knew him and his work, miss him very much today.

4. (Washington, D.C.: EIR News Service, 2001) See the work which I referenced in writing that book: ***V.I. Vernadsky: Scientific Thought As A Planetary Phenomenon,*** B.A. Starostin, trans. (Moscow: Nongovernmental Ecological V.I. Vernadsky Foundation, 1997). In writing what was published as my 2001 book, I had gone no further than this Starostin translation.

5. One crucial, contributing problem in present-day readings of the work of Vernadsky is to be seen as a carry-over of the earlier influence of the implicitly dionysian "ecology cult" of the Cambridge Systems Analysis group on Soviet ideology during the 1970s and 1980s, an influence wielded through the Laxenberg, Austria International Institute for Applied Systems Analysis (IIASA) by such as the U.S.A.'s McGeorge Bundy, and Britain's Club of Rome figures Dr. Alexander King and Solly Zuckermann. Despite some deferences to the Soviet reductionist school in his references to the history of science in the Starostin translation, Vernadsky's strength lies in his actual work in the fields of his original discoveries in physical science; when he departs from that field, his views on the history of social thought, as on the subject of Plato, as expressed in the Starostin translation, are not always defensible scientifically. This was a cause of my cautious approach, until now, to certain material found in the 1997 text.

Lyndon LaRouche with Dr. Taras Muranivsky (1935-2000) in 1996. It was only from 1994 on, LaRouche writes, through benefit of his association with "the most remarkable Professor Taras Muranivsky and the scientist Pobisk Kuznetzov, among others, that I grew more confident of the existence of special, crucially important affinities between Academician Vernadsky's and my own lines of work in redefining a science of physical economy."

mine forwarded copies of some translations of Academician Vernadsky's work, work made available through a collection supplied to Columbia University by Vernadsky's son, Professor George Vernadsky. One of these, a 1935 work, "On Some Fundamental Problems of Biogeochemistry," includes a crucial margin of additional validation of my own conclusions respecting the method which underlies Academician Vernadsky's later argument on the distinction of the Noösphere from the Biosphere. I brought a copy of that 1935 paper along with me as a subject of work to be done during my international travels, and have spent happy hours, while shrugging off jet-lag, in doing my literary duty on this account.

Although the subject of this 1935 paper is the distinction of the chemistry of living processes from those of non-living, rather than the subject of the Noösphere itself, the present relevance of this paper for me, is that, in that location, Vernadsky's exhibits emphatically, and repeatedly, the same principle of investigation which underlies what became his later, categorical distinction of the Noösphere from the Biosphere. For both cases, the Biosphere and Noösphere, the common distinction of his method is that otherwise best identified as Bernhard Riemann's emphasis on what he describes as *Dirichlet's Principle.*

I have already emphasized this connection to Riemann in my 2001 ***The Economics of the Noösphere,*** that Vernadsky himself identified his view of the Noösphere as systemically Riemannian. Back in 2001, I could confirm this in broad terms, as I did then; but I left room for relevant fine points on this account yet to be discovered. A reading of the recently acquired access to Vernadsky's indicated 1935 paper on biogeochemistry, filled in some important blanks left in the material I had considered for my 2001 report.

My acquisition and study of the 1935 paper not only leads me to additional observations on the deep quality of Vernadsky's work on the subjects of both the Biosphere and Noösphere. As that work of his bears on the application of the prospects on development of mineral resources, in my recently published work on ***Earth's Next Fifty Years,*** everything bearing upon a deeper insight into the implications of Vernadsky's referenced discoveries, is of strategic importance for all humanity today.[6]

Nine Excerpts Considered As One

Immediately below, I have identified nine excerpts from the referenced 1935 Vernadsky paper, which I present now, in sequence, without interrupting that presentation with my own argument, the latter which I have consigned to the elaboration developed following that presentation of the cited excerpts. My intent in this procedure, is to afford readers a general flavor of the point I am emphasizing from within Vernadsky's work, while also pointing the relevant specialists to something which is implicitly of deeper relevance than his work on biogeochemistry as such.

I add, as a preface to presenting those excerpts here, that the nature of the content of the 1935 work, when considered in light of his own later writings known to me on the Noösphere, is such that no significant margin is left for assuming any relevant defects in the English translation which I have consulted in what I have to say here. We are dealing with scientific ideas expressed in ways which rise above the ambiguities of differences in the mother-languages of the medium employed. The validity of the ideas of principle stated is imparted by reliance on the experimental standpoint which the responsible mind must always bring to describing the observed tests of crucial-experimental demonstrations themselves.

However, I caution my readers, in the setting in which I

6. LaRouche PAC, 2005.

locate Vernadsky's work here, it is my right and obligation to situate my view of his work within the bounds of my own established competence in relevant features of the branch of science known as physical economy. I believe, that by the close of this present report, I will have made clear the relevant lines of division of labor between my own views and his.

First, take the two following, interdependent paragraphs from Section II of his report on the perspectives of the work being conducted at his Laboratory:[7]

"A great part of our work is connected with a study not of the atoms themselves but of chemical elements, of isotopic mixtures. In purely chemical processes all of the isotopes of the same element are manifested in a similar way, Hence, while we remain within the field of purely chemical processes, the chemical element may be identified with the atom, as it is the case in the periodical system of elements. On this the whole chemistry is based.

"Proceeding from this general statement, it has been possible to show by the work of our laboratory that the *atomic composition of organisms, plants and animals is as characteristic a feature as their morphological form or physiological structure* as their appearance and internal structures. . . . An organism does not show a passive attitude towards the chemical medium; it actively creates atomic composition, it tends to choose, consciously or unconsciously, the chemical elements necessary for life, but as life presents a field of dynamic equilibria, it reflects—both in its composition and in its form—the different physico-chemical properties of the medium. These variations, however, do not change their average, little varying expression."

And, then, in the immediately following paragraph:

"A species established by biologists may be characterized in weight or atomic composition as precisely, as by its morphological features, also within a definite range of variations it may characterize a homogeneous living substance—the totality of organisms of the same species, race, jordanons,—as it is characterized by morphological features. In the average numbers, the amounts of atoms, of chemical elements, composing a living organism, are as constant and as characteristic for it as its form, size, weight, etc. It is possible that in the numerical relations of living beings thus expressed, the same harmonious combinations will be found, which are so distinctly manifest in the vividness of the living nature. They should be probably manifested in harmonious relations of numbers in these natural bodies—in living organisms, as numerical relations are harmoniously manifested in the natural bodies of inert nature—in crystals and minerals. The elucidation of this problem is a task of the nearest future."

Next, take the entirety of the concluding paragraph of the paper's Section II for general background and flavor:

"We have first embraced by the precise methods 18 chemical elements; now, we are able to make a quantitatively precise study of over 60, and we must comprise all of the 92, if not more,[8] for it becomes clearer and clearer that it is in the biosphere that living matter embraces and controls all or nearly all of the chemical elements. All of them *are necessary for life* and not one of them comes to the organism by chance. *There are no special elements peculiar to life.* There are *predominant* elements. When taken as a whole life comprises the total system of Earth elements, probably leaving aside a few of them, as, e.g., *thorium,* but probably comprising all of them in the different isotopes. Life is a planetary phenomenon and predominantly determines the chemistry, and the migration of chemical elements of the upper shell of the Earth—the *biosphere;* it determines the migration of all the chemical elements. A quantitative investigation of such a migration is the fundamental task of the Laboratory."[9]

Next, consider a series of paragraphs which I have excerpted, for emphasis, from Section III of his report, and, after that, a pair of the opening paragraphs from Section IV.

"1. For life the field of life—the *biosphere*—is not a structureless casual Earth's surface—the face of the planet upon which life originated, according to E. Seuss, or the cosmic medium of life according to Cl. Bernard. The biosphere is not only the face of the Earth and not a cosmic medium. The Earth's shell has a strictly definite composition and structure, determining and controlling all the phenomena that take place within it, the phenomena of life included; it is morphologically distinct but closely related to the general structure of the planet.

"A number of the most characteristic and important geological phenomena establish such a character of the biosphere with certainty. Its chemical composition, as well as all the other features of its structure, is not casual and is most intimately related to the structure and time of the planet and determines the form of life observed."

And, next:

"The biosphere is not an amorphous nature, a structureless part of the space-time, in which biological phenomena are studied and established independently of it; it has a definite structure changing in time according to definite laws. This is to be taken into consideration in all the scientific deductions, in the logic of natural science in the first place; and this is not done. The 'nature' of the naturalist is only the biosphere. It is something very definite and delimitated."

And next:

"If this structure is called a mechanism, it would be a special, very peculiar mechanism, a continuously changing mechanism—a dynamic equilibrium—never reaching a state strictly identical in the past and in the future. At every moment of the past and of the future time the equilibrium is different but closely resembling. It contains so many components, so

7. The Laboratory of Biogeochemistry of the Academy of Sciences of the U.S.S.R. The italicized passages in the quoted excerpts of his paper are copied from the original of the English translation.

8. Remember, that this was written in 1935, before the work done on transuranic regions of the Periodic Table.

9. Vernadsky, op. cit.

many parameters, so many independent variables, that no strict and precise return of some state in its previous form is possible. An idea of it may be given by comparing it to the dynamic equilibrium of the living organism itself. In this sense it is more convenient to speak of the *organized state,* rather than of the *mechanism* of the biosphere."

And, from the first, second, and third paragraphs of III.2:

"Life is continuously and immutably connected with the biosphere. It is inseparable from the latter materially and energetically. The living organisms are connected with the biosphere through their nutrition, breathing, reproduction, metabolism. This connection may be precisely and fully expressed quantitatively by the migration of atoms from the biosphere to the living organism and back again—*the biogenic migration of atoms.* The more energetic the biogenic migration of the atoms, the more intense is life. It is nearly dying out or hardly flickering in the latest phases of life, the importance of which in the organized state has not yet been evaluated, but should not be overlooked.

"The biogenic migration of atoms compromises the whole of the biosphere and is the fundamental natural phenomenon characteristic of it.

"In the aspect of historical time—within a decamyriad, a hundred thousand years,—there is no natural phenomenon in the biosphere more geologically powerful than life."

And, under III.3, the following most relevant pair of paragraphs appears:

"The chief geological importance of these masses of substance embraced by life, that seem small when compared to the mass of the biosphere, is connected with their exclusively great energetic activity.

"This property of the living substance, having nothing equal to it in the substance of the planet, not only at the given moment, but also in the aspect of geological time, completely distinguishes it from any other earthly substance and makes the distinction between the living and inert substance of the planet quite sharp, the more so that all the living is derived from the living. The connection between the living and the inert substance of the biosphere is indissoluble and material within the geological time—of the order of a milliard of years, and is maintained exclusively by the biogenic migration of atoms. Abiogenesis is not known in any form of its manifestation. Practically, the naturalist cannot overlook in his work this empirically precise deduction from a scientific observation of nature, even if he does not agree with it due to his religious or philosophically religious premises."

And, then, finally, the four paragraphs opening section IV:

"The whole work of the Laboratory is based on such a structure of the biosphere, on the existence of an impassable sharp, materially energetical boundary between the living and the inert substance.

"It is necessary to dwell on this point, since it appears to me that in this question there is a vagueness of thought, which impedes scientific work.

"We do not proceed here beyond exact empiric observation, the deductions from which are obligatory for the scientist and as a matter of fact for everyone; it is on this observation that he not only *can* but *must* base his work. These deductions may possibly be explained differently, but in the form of *empiric generalization* they are to be taken into consideration in science, for an empiric generalization is neither a scientific theory, nor a scientific hypothesis, nor else a working hypothesis. This generalized expression of scientifically established facts is logically as obligatory as the scientific facts themselves—if it has been logically correctly formulated.

"The sharp material energetic distinction of the living organisms in the biosphere—of the living substance of the biosphere—from any other substance of the biosphere penetrates the whole field of phenomena studied in biogeochemistry."

From that point on, Vernadsky leads the discussion into the region of a Pasteur-Curie conception, a subject of continuing importance for treating the outcome of Vernadsky's lifetime work as a whole, but which should be left for discussion at some other occasion, since we must tend to bound the present discussion here within the limits of the scope of that special topic of method which I have posed to be the subject immediately at hand here.

The Significance of Those Examples

The set of excerpted passages which I have just presented, should remind us of deliberations which should have been familiar from among the most notable features of the greatest known moments of ancient through modern science, especially those highlights of the modern science set into motion by the Fifteenth-Century genius, Cardinal Nicholas of Cusa, and such of his explicitly avowed and faithful followers as Luca Pacioli, Leonardo da Vinci, and Johannes Kepler. We must continue attention to the principle expressed by those authors, to include such followers of Kepler as Fermat and Leibniz, and such followers of Leibniz as Carl Gauss, Lejeune Dirichlet, and Bernhard Riemann. The point which I am stressing in this report, is that the methodological approach expressed by the quoted passages from Vernadsky above, should remind us of Gauss's wrestling with a crucial topic of Earth magnetism, also of the related topic, which we encounter under Vernadsky's four paragraphs of his Section IV above, the topic of the development of what Riemann emphasized as Dirichlet's Principle, and also Riemann's own work based extensively on the immediate foundations developed by his own principal teachers Gauss and Dirichlet.

When this cited 1935 material on the Biosphere is taken inclusively into account, there is no reason to doubt that Vernadsky's work is, as he claims in later writings on the Noösphere, authentically Riemannian.[10]

As I have emphasized at the beginning of this report, knowledge of a discovery of principle is obtained only by experiencing the process of its discovery, not by learning

10. LaRouche, op. cit.

recipes, nor by the deductive methods of the reductionists. *What is most significant in my pointing to the referenced excerpts from Vernadsky's 1935 report on methods of biogeochemistry, is the way in which he structures the process of discovery of that principle which separates the biosphere categorically from a part of the universe which is determined only by the principles of non-living processes.*

The same method for defining such a discovery which he describes in the indicated 1935 report, is that which I developed, in emphatic opposition to Wiener and von Neumann, for defining the underlying, anti-entropic principle of a science of physical economy. On my recent first reading of the 1935 paper at hand, I recognized immediately, that the method he sets forth in that paper for defining the domain of biogeochemistry, provides us evidence of the method he had employed for his subsequent discovery of his concept of the Noösphere, thus filling in some important evidence which I had not found explicitly provided in satisfactory degree in what I had known of translations of his writings on the Noösphere.[11]

I emphasize what I have already stated, that the principle of method expressed by Vernadsky in those cited passages corresponds to what Riemann emphasized as Dirichlet's Principle, a Principle whose footprint jumps up at me in the series of passages from Vernadsky's 1935 document which I have excerpted above. The use of the same method from the 1935 paper, when applied to the subject of the specific distinctions of human behavior from anything met in other living processes, defines the *noëtic* principle of human cognition as distinct from anything otherwise found in the domain of the biosphere.

I emphasize to the present reader, that I am writing this at a time when some of my associates among the LaRouche Youth Movement (LYM) have relived the process of discovery of Riemannian physical geometry to the degree that they have had notable successes in treating some of the essential content of Bernard Riemann's 1857 Theory of Abelian Functions. That is the work by Riemann in which his employ of what he terms Dirichlet's Principle plays a pervasive role. The report I am delivering here, is intended, inclusively, to provoke those readers into developing some useful supplementary insights into the implications of the role of the Dirichlet Principle in Riemann's advanced work. Obviously, once that special part of my intended audience is taken into account, what I present here is relevant for a still broader audience.

1. The Matter of Sphaerics

The method of investigation which Vernadsky expresses in the cited 1935 paper is in the same "archeological" tradition as that which the ancient Thales and the Pythagoreans adopted as the Egyptian school of astrophysical science known to the Greeks as "Sphaerics."

For example, the term "archeology" is perhaps the best choice of irony for pointing to the need to consider the fact of a turbulent transition which occurred after perhaps something less than 10,000 years of initial melting of the hundreds of thousands of years of glaciation of much of the northern continental hemisphere, during an interval prior to the climactic melting which flooded a great fresh-water lake, now known as the Black Sea, with the salt water flooded in from the Atlantic by way of the Mediterranean.[12] *I now emphasize a special kind of archeology, not usually treated as such, in which a lack of material available on site must be overcome by focusing on what early periods of human existence and development, which, perhaps, occurred in other places, must have deposited as ideas, as if these were footprints, on the physical archeological site whose evidence we are considering.*

After all, the human species, as distinguished from apes and other animals by the human individual's cognitive powers, has lived on this planet for as long as perhaps a million years, or, perhaps, even much more. The transmission of the cognitive kinds of ideas which are unique to, and everywhere characteristic of the behavior of the human species, must have been transmitted, in significant part, into historical times and places from very ancient dates, and from different places, certainly long, long before 17,000 B.C., including the hundreds of thousands of preceding years of generations, during a time much of the northern hemisphere was under great slabs of glacial ice.

Despite the kinds of great "natural" catastrophes, and also man-made relative dark ages which mankind has endured on this planet, there is a wonderfully stubborn resilience of our species, such that something essential springs up from the ashes of catastrophe, sometimes transmitted from earlier places where human habitation may have been subsequently erased.

Thus, ideas such as those expressed by the Egypt of the time of the building of the Great Pyramids, must have been largely developed in other places, from a time when the levels of the oceans were about four hundred feet lower than today, a time even tens of thousands of years prior to the first settlements near the mouth of the Nile of that time, and prior to the changes in climate and geography of our planet brought about by the melting of the earlier great glaciation.

We are looking therefore, from sites such as ancient Egypt, into much earlier, glacial times during which the most advanced cultures of the world were transoceanic, and, as

11. As I have stressed in an earlier location, to appreciate the work of Vernadsky, one must take into account the aversive circumstances of the hostility his achievements bestirred among the official Marxist-Leninist ideologues of those times and places. The concepts which I reference, as crucial, in this present report, would be deeply resented by any reductionist ideologues, including the most zealous materialists of the F. "Opposable Thumb" Engels tradition in "science." It is only to be added, that the Marxist-Leninists were comparatively innocents on this account, when compared with the virtual criminality of our contemporary positivist and existentialist tribes.

12. E.g., Plato, ***Timaeus,*** passim.

some of Bal Gangadhar Tilak's relevant works point out,[13] the most advanced knowledge was dominated by the role of astronomy in such prominently included functions as astrogation. The very long astronomical cycles referenced by the work on ancient calendars of Tilak and others, and study of the methods employed by Thales, Aristarchus of Samos, Eratosthenes, and others, shows us how such knowledge of astronomy and astrogation was developed by methods implicitly available to any ancient civilization, even of the glacial ages, by cultures which were engaged by the challenge of transoceanic astrogation.[14]

Mankind's earlier attributable science, in the sense of modern physical science, framed man's concept of that which is universal, by looking upward toward the universe in the large. It is definite knowledge, that the birth of science in European civilization, such as the work of Thales and the Pythagoreans, was principally influenced from Egyptian sources falling under the category of *Sphaerics,* not the contrary, reductionist methods typical of Mesopotamia, for example. As the work of Vernadsky in the matters of the Biosphere and Noösphere should remind us, it is Egyptian Sphaerics which supplied European civilization with its original science, its original notion of science as subsumed by those purely physical-geometrical notions of universality which man recognizes in the astrophysical depths of an Egyptian astronomy which had turned, long before the time of the Pythagoreans, to the long waves of development of astrophysics which were continued into the work of the Eratosthenes whose discoveries made possible the map, crafted by Toscanelli, and used by Christopher Columbus to guide his first voyage of Transatlantic discovery.

The greatest, and most ancient of all archeological artefacts, are to be found in the domains of astrophysics and its application to such subjects as transoceanic navigation.[15]

If we can fairly estimate the local origins of Egyptian culture as dating from approximately 8,000 B.C., how might the culture reflected in the astrophysical characteristics of the Great Pyramids be traced to roots in the forms of human civilized existence existing under the conditions of glaciation? Implicitly, that is the issue of scientific method which permeates Vernadsky's 1935 design for the further scientific work of his Laboratory in fundamental questions of biogeochemistry. Such were the methods of *Sphaerics* employed by the Pythagoreans and their follower Plato.

What is human about the Great Pyramids of Egypt, for example? Is it the stones? Or, is it not something modern man was often reluctant to discover, the ideas expressed in the way those stones were arranged, and in the methods by which those pyramids were constructed? It is tens of thousands of years of astronomy expressed by the physical principles which those stones express, as we see, similarly, the implications of the Equinoctial cycle expressed by the calendars embedded in Vedic hymns composed in Central Asia more than six thousand years ago.

The way in which the human mind, working in societies over intervals of many generations, generates valid ideas respecting the practicable knowledge of the organization of the processes of our planet, is as much an archeological artefact as any physical object or written ancient record. This is the case, even if the place where this idea was developed no longer exists to provide us a physical record of that culture's activity. Rather, because of the nature of man, as distinct from the beasts, those ideas are much more the characteristic physical, archeological expression, the truer artefact of humanity, than any mere physical artefacts in themselves.

A practicable applied science of the way in which the *noëtic* power specific to the human mind develops discoveries of principles and of their applications, should be adopted as the most important of all working archeological principles. This has reflections in Vernadsky's treatment of the geology of the Biosphere in the 1935 paper, and is the implied challenge for the development of an applied archeology (i.e., epistemology) of the cognitive domain of human existence.

On this account, the notable characteristic distinction of the work within the domain of *Sphaerics* by the Pythagoreans and Plato, is that it belongs within the category of astrophysics, rather than the mere astronomy of an Aristotelean such as the celebrated Roman Imperial hoaxster Claudius Ptolemy, or the more honorable later astronomers such as Copernicus and Tycho Brahe. This distinction of ancient astrophysics from ancient and modern astronomy as such, is best presented today from the vantage-point of Carl Gauss's crucial 1799 attack on the hoaxes perpetrated by empiricist fanatics such as D'Alembert, Euler, and Lagrange—fanatics imitated by Laplace and Cauchy later. As Gauss made explicit in his later writings on the subject of The Fundamental Theorem of Algebra, the relevant distinction between mere astronomy and astrophysics, as applied retrospectively to the case of the Pythagoreans, is expressed in modern mathematical-physics language as the Gauss-Riemann notion of a physics, rather than a mere mathematics, of the complex domain. This mathematical-physical, rather than merely formal-mathematical view of the complex domain, is indispensable for insight into the powerful implications of Vernadsky's discoveries.

---

13. ***Orion, Arctic Home in the Vedas.***

14. There is a reflection, thus, from distantly ancient times in the work bearing on even "ice age" cultures by the Egyptian Platonic Academy representative of Cyrenaic origin, Eratosthenes. His measurement of the longitudinal circumference of the Earth, from within Egypt, and his measurement of the distance along the arc from Alexandria to Rome, are exemplary. Compare this with Tilak's ***Orion*** and ***Arctic Home in the Vedas.***

15. A notable precedent is to be found, once again, in the way in which Toscanelli, a close collaborator of Cardinal Nicholas of Cusa, crafted the map of the world which was used by Christopher Columbus to rediscover North America. Despite Venetian lies respecting the distance from Italy to the coast of China, the principles expressed by the crafting of that map are to be traced to the work of the Platonic Academy's Eratosthenes, who measured the longitudinal circumference of the Earth from two points within ancient Egypt. Similar is the case emphasized by Tilak in his ***Orion,*** of the knowledge of the equinoctial astronomical cycle by a Vedic culture existing in central Asia during the interval 6,000-4,000 B.C.

The evidence which qualifies us to say that one ape-like creature is human, and another essentially represents some species of ape, is that characteristic of the human mind which is the well-spring of mankind's ability to effect willful increases of our species' potential relative population-density. The distinction is not, as we know, "tool-making," for which even chimpanzees created in the likeness claimed by F. Engels have shown aptitude. It is creative behavior of the type expressed by the discovery and proof of some universal physical principle. *It is such creative behavior which distinguishes mankind systemically, as the conception of the Biosphere reflected in the quotations introduced above distinguishes living from abiotic processes.*

Let us emphasize this point. This quality of behavior, unique to the human species, is not found in biology, just as Vernadsky emphasized, the principle of life is nowhere found within the ontological bounds of the abiotic domain.

Therefore, in the study of living species we do not define life as a phenomenon of the inorganic laboratory, but only as Vernadsky does, in terms of effects which could not be produced by an abiotic physics. *Life is produced only by life.* Cognition is generated, not as a characteristic of living processes, but as the characteristic impact of the respectively higher principle of cognition upon living processes.

Therefore, the method employed by Vernadsky is the method of systemic studies of fossils. We compare the fossils of abiotic activity with the contrasted fossils of living activity, and contrast the cognitive processes to the fossils of non-human living activity. *Only cognition can produce a cognitive response.* It is the artefacts of cognition which express humanity. It is the fossils of cognitive action which betray the evidence of the existence and character of the human species. Every categorical kind of distinction which Vernadsky cites, as in the sample of excerpts from his 1935 paper, has a parallel in distinguishing the content of the Noösphere from that of the Biosphere.

Thus, the difference between the human species and other living entities, lies in the difference in ordering of their accumulation of fossils. We can not see life in the physics of abiotic processes. We can not see cognition, the distinction of the human individual from the beast, in the living matter of the human individual. We see cognition in its artefacts, the artefacts of those creative powers of the individual human mind which can not be found within the bounds of biology. In the Biosphere, we see the power of life manifest in the ongoing ordering of fossils. In the Noösphere, we see, as the relevant class of "fossils," the effects of the noëtic powers of the mind of the individual member of the human species.

In the fossils of the Biosphere, we trace the shadow of the hand of life. In the fossils of the Noösphere, we trace the shadow of the hand of cognition, of the noëtic principle of the sovereignly individual mind.

Look at the physical principle of the complex domain, as made adequately clear by the combination of Riemann's 1854 habilitation dissertation and 1857 Theory of Abelian Functions, in that light.

Geistesmasse and Dirichlet's Principle

The notion of the complex domain was a necessary development of mathematics, in order to free mathematics from formal mathematics' perversion, from its enslavement by a reductionist's system of an *a priori* set of so-called definitions, axioms, and postulates. It was Riemann's use of this work by Carl Gauss, to free science from the numbing of the human mind by allegedly "self-evident" definitions, axioms, and postulates, as Riemann did in his 1854 habilitation dissertation; it was Riemann's continuation of that development, strengthened by a legacy of the work of Abel and Dirichlet, which made possible the development of a form of physical science which were uncorrupted by aprioristic or other reductionist presumptions. For this later accomplishment, as by Riemann, the work of Leibniz and Gauss, and of Cusa, Leonardo, and Kepler before Fermat and Leibniz, were among the most crucial modern precedents.

The reductionist's foolish, blind faith in the alleged self-evidence of sense-perceptual experience, depends upon ignoring the elementary fact, that sense-experience is not reality *per se,* but, rather, merely the conscious reflection by the senses, of the impact of some aspects of physical reality upon them. Within the bounds of a mathematics based strictly upon sense-perception-oriented, reductionist views, such as those of a classroom Euclidean geometry, there is no place allowed for the experimentally demonstrated existence of an efficient form of universal physical principle. This problem of representation was solved, largely through the work of Gauss's laying the groundwork for the physical conception of a complex domain. However, the principle expressed by Gauss et al. in this way, was already implicit in the view of *Sphaerics* expressed by the work of the Pythagoreans, and by Plato after them.

Experimentally validatable sense perceptions are real, but are not reality as such. Reality is expressed, typically, by notions such as *life* and *cognition,* two really efficient classes of states of the physical universe, whose effects are efficiently expressed as the experience of our senses, *but which are not themselves the explicit subjects of sense-perception.* We know these so-called transcendent realities, such as life and cognition, only in a way which the notion of the Gauss-Riemann complex domain reflects. Dirichlet's Principle was recognized by Riemann as the necessary ontological glue which made the connection between the two aspects of the complex function truly comprehensible. We recognize these realities in the only way in which they could be recognized, by the successful practice of living beings in general, as known through the application of the creative mental powers unique to the human species.

When the chief work of Vernadsky is considered from this historical vantage-point in science, his successive defini-

tions of Biosphere (life) and Noösphere (cognition), the deepest experimental implications of Riemann's insight into Dirichlet's Principle, and the related implications of Riemann's emphasis upon *Geistesmasse,* are made clearer from an experimental standpoint.[16]

I shall explain this, but, that I might do so, first, permit me to resume my attention to what I shall show to be the historical matter of *Sphaerics.*

Sphaerics, as the Pythagoreans and Plato used it, signifies *universality.* Experience shows that we on Earth dwell within a deep universe whose most typical expression for the senses, is motions apparently ordered for our sense-perceptions as within a spherical experience of the universe we observe from the surface of our home planet. It is perceived as a spherical form of physical space-time of unknown, but vast depth.

Within this there are certain observed motions which, when normalized to take into account the motions of the Earth itself, are simply circular or spherical: the universe according to the doctrine of Aristotle, for example, the universe of mere astronomy.

Then, there are seemingly anomalous astronomical motions which do not fit such simplistic explanations; there are higher forms of regularity which express unseen, but efficient universal physical principles acting within and upon the apparently astronomical universe. These higher forms of regularity, in which universal physical principles are defined, is the domain of astrophysics. This defines the essential difference between Copernicus and Kepler, the essential superiority of the work of Kepler over that of Copernicus and Brahe, the difference between mere astronomy and astrophysics.

As the application of knowledge of thermonuclear fusion compels us to view Kepler's organization of the Solar System accordingly, all Earth-bound physical science becomes a subsumed feature of astrophysics. Astrophysics is, thus, the context in which all competent pursuit of physical science must be located, and from which the most crucial aspects of physical science, such as those traced from Thales, the Pythagoreans, et al. to ancient Egypt, must be traced.

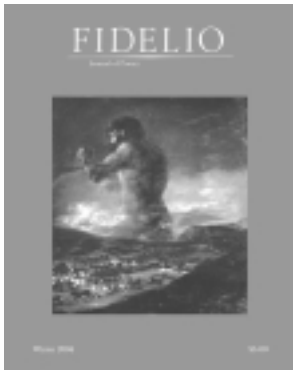
The case of the Pythagorean Archytas' construction of the doubling of the cube solely by geometrical methods, is, thus, the prime example of the principle of astrophysics passed down from the Pythagoreans, through Plato's scientific method, to the present. The relevance of Archytas' solution for the constructive exact doubling of the cube, is the relevant provocation leading through Gauss's 1799 attack on the fanatical blunders of D'Alembert, Euler, and Lagrange, to the level of development of physical science associated with the life's work of Riemann. This astrophysical principle is the key to that aspect of the organization of Vernadsky's mind expressed in his approach to defining both the Biosphere and Noösphere. The outline of the adopted tasks set forth in the referenced 1935 paper, is typical of this method.

In the experience represented by the Gaussian complex domain, we combine the notion of the sensed object with the notion of the effect on its motion generated by the unsensed, but efficiently manifested principle. One component is, on principle, a view of the relevant phenomenon within the domain of a spherical universal space-time of sense-experience. The other component is the unseen, but actual universal physical principles acting upon the object of perception. The modern typification of this relationship is the argument underlying Cusa follower Kepler's uniquely original discovery of a principle of universal gravitation, a discovery which marks the modern transformation of mere astronomy into a subject of astrophysics. After that, no longer can motion within the observed universe be attributed to the repeatable regularity of motion, as by the modern defenders of the hoaxster Claudius Ptolemy, but must be traced to the power exerted by an unseen, but efficient and knowable universal physical principle.

The Dirichlet Principle

In his 1857 essay *Theory of Abelian Functions,* Bernhard Riemann brought to light the deeper epistemological significance of the complex domain, through a new and bold application of a principle of physical action which he called "Dirichlet's Principle." Riemann's approach, combined with what he enunciated in his habilitation dissertation of 1854, ushered in a revolution in scientific thinking.

Lejeune Dirichlet was a pivotal figure in early 19th-Century science, in the tradition of Carl Friedrich Gauss. Riemann studied with him beginning in 1847, and when Dirichlet died in 1859, Riemann was appointed to his chair at Göttingen University.

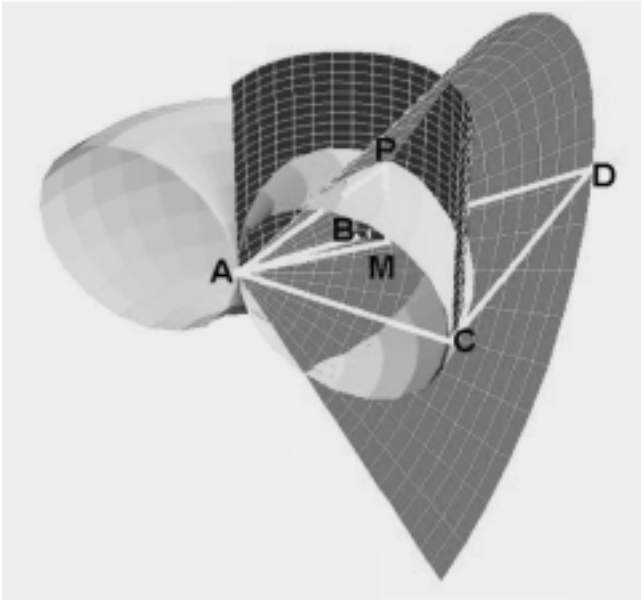


Fidelio magazine (Winter 2004) examines this work in "Bernhard Riemann's 'Dirichlet's Principle,' " by Bruce Director; and "LeJeune Dirichlet and the Mendelssohn Youth Movement," by David Shavin.

Subscriptions to the quarterly are $20 and can be ordered from the Schiller Institute, at www.schillerinstitute.org.

16. Cf. ***Bernhard Riemanns Gesammelte Mathematische Werke,*** H. Weber, ed. (New York: Dover Publications reprint edition, 1953). See Riemann's posthumously published papers in that location. *Geistesmasse* can be roughly translated as "thought object."

Archytas' Construction for Doubling of the Cube



Archytas' solution to the Delian paradox typifies the work of pre-Euclidean, physical, constructive geometry. Here, members of the LaRouche Youth Movement have built a pedagogical device to demonstrate his solution, which creates a cone, a torus, and a cylinder in order to find the geometric means between two magnitudes—AC and AB in the drawing. For animated graphics of this and related problems in constructive geometry, see Lyndon H. LaRouche, Jr., "Our Economic Policy: Animation and Economics," at www.larouchepac.com.

When we trace the intellectual history of the idea of the complex domain from the practice of *Sphaerics* by the Pythagoreans and Plato, we proceed in mathematical constructions through the anti-Euclidean, geometrical doubling of the square, to Archytas' geometrical doubling of the cube. The implications of this are made clearer through recognition of the frauds which the Leibniz-hating empiricist ideologues, D'Alembert, Euler, and Euler's protégé Lagrange perpetrated in connection with existence of those cubic roots which are, in fact, implicitly locatable within Archytas' construction. The situating of the implications, for experimental *Sphaerics,* of elliptical and higher functions implicit in Kepler's uniquely original discovery of gravitation, and related discovery of the harmonic ordering of planetary orbits, defines the needs to go beyond the barest conception of *Sphaerics,* as a precondition for mathematical conceptualization of the existence of any universal physical principle.

So, Kepler summarized this and his related accomplishments in study of the Solar System as a whole, with two directives transmitted as tasks to "future mathematicians." First, the development of a truly infinitesimal calculus, that of the type uniquely developed by Gottfried Leibniz, including Leibniz's catenary-cued, universal physical principle of least action. Second, the importance of the generalization of the implications of elliptical functions shown not only in the characteristic of Earth's orbit, but the composition of the Solar System in general. The latter work was accomplished by contributions from numerous contemporaries of Gauss, chiefly French and German, but especially by Gauss and Riemann. This was the framework for the general development of the notions of the complex domain, and of curvature, by Gauss, and the continuation of Gauss's work by the original discoveries of Riemann.

Yet, we must never lose sight of the fact, that these accomplishments of modern European science are rooted in the Pythagoreans' and Plato's development of the Egyptian heritage of *Sphaerics.* Progress was never simply continuous in history. The emergence of reductionists such as the Eleatics, the materialists, the Sophists, the Aristoteleans, and the Romans, were grave intellectual and moral set-backs to the progress of European civilization. From the historical vantage-point presented by that view of history, the ideas of the Pythagoreans were not actually superseded by the development of those reductionist systems which repudiated the original Pythagorean-Platonic basis. The essential axiomatic issues posed to the Pythagoreans are still among the most crucial issues for scientific method today.

The crux of all ontological issues so posed by the known history of civilization, European civilization in only its specific way, may be stated as a question: "Since universal physical principles are proven to exist with full efficiency, even though they are not themselves objects of sense-perception, how is it possible that the human mind could conceive a universal principle as a object of the mind? For this, Riemann once borrowed a concept for such objects of thought from the anti-Kantian educational philosopher Herbart, *Geistesmasse.* Later, he expressed this notion by reference to what he identified as Dirichlet's Principle, with notable emphasis on the implications of his own 1857 ***The Theory of Abelian Functions,*** the theory of the generalized *Riemann Surface.* Vernadsky's definition of the methods of investigation of the Biosphere, and his concept of the Noösphere, are conceptions of this type associated with Riemann's notion of Dirichlet's Principle.

Any validatable physical principle is universal in its intent and scope, even though it may appear to apply to special situations within the universe at large. We may say that any discovered principle appears to have been lurking, waiting for its opportunity to pounce. How can we conceive of a universal principle as a definite object of the mind? A useful response to that question would be the way in which Riemann replaced (but doubtless did not discard) his use of the term *Geistesmasse* by his emphasis on Dirichlet's Principle. We hear little explicitly from Riemann on the subject of *Geistesmasse* again, because the mathematical-physical technical term for that named subject was changed to *Dirichlet's Principle.*

Dirichlet's Principle defines a class of physically efficient mental objects which are never perceived, but whose existence is efficiently demonstrated by crucial types of experiments. *Life* and *Cognition* are higher qualities of expression of such objects.

These objects do not exist as real in the vocabulary of the relatively stupefied intellects of the class known to theologians as *Gnostics,* such as reductionists, such as the materialists, empiricists, positivists, existentialists, and as killers in the names of religion, of the type of Dostoevsky's Grand Inquisitor, who may say "Kill them all and let God sort them out."

That much said, let us proceed by taking the further discussion of this subject to my own home-base, the subject of the science of physical economy.

2. The Science of Physical Economy

The same quality of conceptual challenge posed by Vernadsky's 1935 case for the biogeochemical domain, arises as the qualitatively more profound, central feature of organization presented to us by the subject-matter of economic science. This fact should not be a surprise to any matured thinking person of modern times. Cognition is of a higher order than the abiotic and biotic domains.

It is already implicit in what is written in preceding portions of this present report, that I place the authority of the evidence of a science of physical economy, on the highest level among branches of science. The basis for making that argument is implied in Vernadsky's achievements in defining the Biosphere and Noösphere successively. As I shall restate the case at suitable points later in this present writing, the functional characteristics of the living practice of a well-defined science of physical economy, is the summation of man's capacity for acquiring and proving any kind of new experimental knowledge. It is in observations and experiments conducted from the advantageous position of that pinnacle of man's place in the universe, his place in the Noösphere, that the highest level of knowledge of physical science knowable for man is to be found.

The reader should bear that point in mind, both in reflections on what I have said respecting science above, and what I shall add below.

After all, man is a living organism, whose existence is biologically a part of the Biosphere, and depends upon the Biosphere. Yet, that is not the essential distinction of the human species, nor of the individual member of that species. The essential distinction is "intellectual," a quality in the image of the Creator of the universe, a quality of a higher order than anything experienced in any other living species. Since, as Vernadsky emphasizes, the Noösphere is expanding, relative to the Biosphere, so, just as the Biosphere should be continuing to grow relative to Earth's immediate abiotic domain, we must say that, just as Vernadsky emphasizes that abiotic material is used by the processes of the Biosphere, and exchanged within the abiotic domain, so the biotic features of the human individual, and individuals are used in accord with those higher principles expressed in the Noösphere.

Mankind's historically recent personal entry into exploration of nearby Solar space implies the Noösphere's absorption of the Solar System as of the Earth itself.

These considerations just stated here, are not mere analogies, but appropriate descriptions of the state of affairs already in progress.

Therefore, economy, insofar as it is not expressed in forms of mass human behavior which degrade human beings to the relatively "zero growth" population potential of a species of ape, is an expression of the highest order in the universe explicitly known to us, the Noösphere. Therefore, no one should be astonished to learn that any competent theory of economy must have the most essentially distinguishing characteristics which are to be inherited, so to speak, from knowledge of the participating role of the principles distinguishing both the respective and combined characteristics of the Biosphere and Noösphere. In other words, the same kinds of qualifications which Vernadsky's 1935 work specifies for the Biosphere's distinction from the abiotic domain, and, similarly, for the distinction of the Noösphere from the Biosphere, are the implicit foundations of any competent approach to defining and governing a real modern economy.

In the simplest kind of example of the discovery of a universal physical principle, the apparatus, or its functional equivalent employed by us, contains a feature which corresponds to the demonstration of the principle which is being tested. This is typified by the crafting of machine-tool designs for such purposes as testing an hypothetical experimental principle. If the test experiment has a positive outcome, the relevant aspect of the machine-tool or like experimental design, then becomes the point of departure for designing processes, such as those which might be used in manufacturing, processes which incorporate the function of the discovered principle into regular human practice.

I have often used the image of the "goldfish bowl" to illustrate the significance of this kind of experience. This con-

sideration brings us to the point of reflections on a crucial problem of economy considered as a physical, rather than a monetary process.

In contemporary societies so far, most of the people operate on the basis of a set of the typical individual's more or less witting assumptions, some of which are supported by practice, and many frankly absurd. The total set of such assumptions, useful and false combined, is a mind-set which can be likened to the condition of a captive fish in a fishbowl-like container.

So, it might often appear to us that the behavior of those people we observe in action is confined within virtual walls, like those of some container, where no such "wall" actually exists outside their own mind. Those people are not responding to the real world; they are confining their actions to a special, imagined world, whose "walls" are not only a combination of both respectable and absurd axiomatic assumptions alike, but also reflect much ignorance of and indifference to many actual principles and conditions existing in the universe.

The simplest classroom illustration of this can be provided by showing the pathological character of the set of definitions, axioms, and postulates associated with a classroom Euclidean or Cartesian geometry. This presents us with a case in which all of these varieties of presumptions are false. Constructions made according to those principles of *Sphaerics* employed by the Pythagoreans and by Plato, lead us toward direct and accurate calculations, whereas attempts to address the same matter within the framework of a Euclidean or Cartesian geometry become a cause for rituals which incur needless frustrations, and often also embarrassing mistakes.[17]

We must concede, however, that the ideal Euclidean or Cartesian mind, while inherently pathological in its own right, might seem to be almost a marvel of orderliness, even a certain excellence, when it is compared with the currently prevalent everyday opinions of most people on the subject of scientific and social behavior in general. No further concession in this matter were needed, or permissible.

In any case, the elimination of false, axiom-like assumptions, or the addition of a discovered, valid universal principle, has an effect which causes the range of behavior to extend into a realm outside the implied walls of that person's prior, goldfish-bowl-like belief-system. The effect of such changes is to raise the power of the relevant human activity by some order of magnitude.

Thus, for example, the increase of the density of power expressed by technological progress from sunlight, to wood-burning, to charcoal, to coal and coke, to nuclear, and to thermonuclear power, represents a kind of effect which we may interpret as human willful increases in the intensity of heat per square meter of cross-section of the relevant heat-flow. My associates and I have often found it convenient to present this fact in the language of "energy-flux density." These and related increases of the density of the equivalent of heat-flow are marked by points at which a qualitative change in society's relationship to its environment occurs, a change from a relatively less powerful, to a more powerful system.

Usually, it is the intensity of the heat-flow, rather than the total amount of heat added, which defines the crucial points in this process. Thus, proceeding from various forms of chemical combustion as a source of heat, to nuclear fission, and then thermonuclear fusion, corresponds to a shift to qualitatively higher forms of physical action. The critical values marked along a scale of such changes, each correspond to successively higher physical states, such that mankind's power over its environment, per capita, and per square kilometer, is increased qualitatively at critical points of qualitative change.

Generally, these qualitative improvements in man's power to exist, are the outgrowth of either discarding some of what are shown to have been false "axiomatic-like" assumptions, or the addition of the use of a discovered new principle, or some combination of both types of actions. This means either "tearing down the walls" of the fishbowl, or moving the walls outward, to encompass more and more of the real universe in mankind's search for a greater scope for the quality of action which is relevant to the increase of, and capacity for survival of the human species. Different categories of what we may measure by the crude yardstick, "energy," may be regarded as presenting us with "walls" which can be breached only through qualitative changes in scope of human practice.

Notably, the principal markers of the qualitative implications of these increases of intensity may be either molecular (distinguishing both abiotic and biotic), atomic, nuclear (e.g., nuclear fission), or sub-nuclear (thermonuclear, matter-antimatter). The quality of action possible, and the order of nature in which the domains for such qualities of action are entered, compel us to give up simplistic ideas about "energy,"[18] and to regard today's popular beliefs about "energy" not as expressing the work of nature, but as the product of superstitions crafted in service of fallible ideologies.

The discovery of practicable approaches to controllable use of resources of these relatively higher order domains, is one of the ways in which walls of the ideological fishbowl of current cultural practice are to be broken.

---

17. For example, the assumption of three respectively independent senses of direction in empty space depends, as Euler, in his own 1761 ***Letters to a German Princess,*** argues against Leibniz in his insistence upon a value of "absolute zero" curvature for any interval of action, whereas experimental physics, such as those of Leibniz's universal physical principle of least action, shows that, contrary to Euler, Lagrange, and Cauchy, for example, no infinitesimal could be so small that it would have "zero" curvature. There is no existing abstract space, time, or matter, but only efficient physical space-time. The absurdity of Euclidean and Cartesian reductionist schemes is about the only thing in geometry which is truly self-evident.

18. The fact that we can measure the height of dogs, cows, and people by the same yardstick, does not allow us to class all as species of yardsticks.

The willful changes in behavior, in organization and use of power, by means of which mankind maintains and also increases our species' potential relative population-density, express a unique distinction of the human species from all lower forms of life, including, of course, each and all of the varieties of great apes. The resulting distinction of man from the lower forms of life, defines an implied argument which sets man's existence essentially above the Biosphere within which he participates. That is so in the sense, for Vernadsky's 1935 paper, that the principle of life distinguishes the concert of living processes from the abiotic domain. *This distinction is an essential universal principle of real economies.*

What is true of raising the level of the quality of power applied, is paralleled by other adoptions of valid added principles to the repertoire of human action.

So, just as the principle expressed by living processes defines a boundary separating the Biosphere from the abiotic domain, so the effect of the principle of cognition defines a Noösphere which is functionally and otherwise distinct from the Biosphere. The three domains, the abiotic, the Biosphere, and the Noösphere, interact, and exchange material with one another, but, as Vernadsky argues in the 1935 location referenced here, the boundary which separates the one process from the others is definite, and of the quality of a lawful universal physical principle. The appropriate conception of such boundaries is the notion of Dirichlet's Principle.

There is not one of the conditions I have selected from what is described by Vernadsky, in the 1935 report, for this kind of distinction of the Biosphere from the abiotic domain, which does not have a correlative in the distinction of the Noösphere—*which is to say the physical economy*—from both the abiotic and the Biosphere, although it is the same abiotic and organic material of the universe at large which is shared among them. The three systems, abiotic, Biosphere, and Noösphere, each have a characteristic universal principle of action, distinct from the other two. In each case, action within that domain is organized according to that characteristic principle of the domain, but the principles typical of each domain, and therefore the result, are different.

However, although it is correct to emphasize the relative distinction of each of the domains from the others, there are higher principles which both define the commonality of the elements of that three-fold domain, and also order the relations among them.[19] This brings us to the challenge represented by the idea of human cognition itself. After treating cognition as creation, I shall return our attention to the matter of the comparison of the ways in which Vernadsky and I have, respectively, obliged ourselves to treat the issues of universal principle associated with the respective phenomena of life and cognition.

19. This kind of distinction corresponds to a notion which Plato addressed, famously, under the topic of the general notion of hypothesis.

What Is, and What Is Not Creation?

The human discovery and use of a discovered universal physical principle, is not only an efficiently physical action. It is one of the essential expressions of the most typical quality of categorically human activity. To follow Vernadsky: *It defines the way in which society (i.e., the Noösphere) organizes the flow of both abiotic and organic materials which it absorbs, uses, and discharges.*

At this point, I must illustrate that point in ways which engage what might be termed the practical experience of economy by any intelligent citizen.

The individual thinks of a useful sort of typical product of agriculture or manufacturing as an independent object, produced by the will of a definite set of people performing the appropriate actions in some definite place. Typically, this produced object may be transferred to some other location, were it might be stored for a while, or purchased, and taken away for consumption.

That individual thinks of the exchange of the product or service produced by one person, for a different product or service by another. Typically, it seems to each that all this can be explained in the language used for financial accounting practice. That kind of belief in accounting is essentially an illusion.

The relationship of the particular product or act of production within an economy, to the economy as a whole, is of a character more than merely analogous to the relationship among all of the components of the Biosphere to one another, and to the abiotic domain.

As Vernadsky emphasized in his published 1935 work principally referenced here, the characteristic feature of the Biosphere as a whole is its development as a whole, a development from a relatively lesser, to a relatively greater significance for our planet, and, implicitly, therefore, the universe as a whole. This development, when it occurs, is characteristically anti-entropic. By anti-entropic I mean a system which is overall, characteristically anti-entropic, expressing a universal principle of action which is moving its universality as a process from lower to higher states of organization. It does not signify "negative entropy," as a case of local, temporary reversal of a universal entropy.

Thus, life is characteristically anti-entropic.

In the case of society, the directed process of increase of the Noösphere, is also characteristically anti-entropic. Absolutely or relatively entropic states may exist within part, or the whole of the Biosphere, or Noösphere at times, but such conditions are inherently pathological states of those phase-spaces.

To restate the same point, say that humanity is typically Promethean, in the sense of that term associated with Aeschylus' ***Prometheus Bound.*** Recall, that the evil Olympian Zeus condemned the immortal Prometheus to nearly eternal torture for imparting knowledge of the use of fire to human beings.

In other words, Zeus, like the Physiocrat Dr. François

Quesnay, and Turgot later, degraded man as Quesnay based his doctrine of *laissez-faire* on the assumption that farmers were, functionally, merely a form of cattle on the titled landlord's estate. Remember that the entire economic dogma of Lord Shelburne's Anglo-Dutch Liberal system was based on the doctrine of "free trade" which Shelburne's lackey Adam Smith plagiarized from the *laissez-faire* dogma of Quesnay and Turgot. Similarly, Bernard Mandeville, the titled "patron saint" of today's Hellish Mont Pelerin Society, based the profit of society on the unbridled license of Enron-like private vice.

In reality, contrary to the Olympian Zeus, man and woman made in the image of the Creator, are naturally creative. Scientific progress based upon the realized effects of the endless discovery and command over universal physical principles, is the essential nature of mankind, the essential nature of the Noösphere. So, as evolution of species of life drives the Earth to higher states of existence, above the abiotic, so the characteristic form of successful action by society is the increase of man's power over the planet, per capita and per square kilometer of the planet's surface. This creative activity, which modern society has recognized in the benefits of scientific and technological progress, is essentially anti-entropic.

This brings us to a crucial point in the relevant argument. Since the characteristic activity which defines the existence and persistence of the Noösphere is *universal anti-entropy, the characteristic feature of every action within the Noösphere is its relative anti-entropy.* The essential part of what is being exchanged within the economic process as a whole is the relative anti-entropy expressed by the way in which the generation, circulation, and consumption of products is organized.

In this respect, the characteristics of the Biosphere, as Vernadsky and his Laboratory defined it, and Noösphere, as I define physical economies as wholes, are analogous. Everything to which I have referred, on this account, in excerpting Vernadsky's 1935 paper, has a parallel in my methods of a science of physical economy. The relations among the products of the Noösphere have an echo in the relations among the chemical elements circulating within the Biosphere, as in Vernadsky's 1935 account of such kinds of relations between the Biosphere and abiotic domain.

Both domains, the Biosphere and Noösphere, are characteristically anti-entropic, but the characteristics differ qualitatively.

Globalization as a Form of Evil

In its broader expression, creativity is expressed by Classical modes of artistic composition (as distinct from most of today's leading preferences in popular art) in plastic and non-plastic art-forms and their application to other aspects of human practice. Creativity is not something optional in human choices of behavior; that is the only thing which actually distinguishes your choice of political candidate, or painter or musician, from the apes.

It is through that action of the individual human mind, that the repertoire of increased numbers of universal physical principles are not only discovered, but deployed to change man's relationship to the universe qualitatively in an upward direction. *The increase of the Noösphere, relative to both the abiotic domain and the Biosphere, through the fruits of willful cognition, is not only as change in mankind's relationship to the universe; it is an efficient change in the characteristics of action within that universe.* Just as the Biosphere, including its fossil products, are taking over more and more of the Earth, so the accumulation of scientific and technological progress gained through cognition of individual souls, is increasing its domination of the planet relative to the Biosphere.

I had the occasion recently to point out a certain absurdity permeating commonplace beliefs respecting so-called "globalization." That discussion occupies a notably relevant place at this point in my report. It illustrates the point which I have just made on the subject of creativity.

The suggestible, more poorly educated mind thinks of economy as the devotees of Bernard Mandeville, Adam Smith, and the British Foreign Office's Jeremy Bentham did. In fact, contrary to today's more or less conventional, and reigning "monetarist" opinion, it is a rule of thumb in modern economy that approximately half of the true cost, of the indispensable total product of labor within society, is expressed as what we term basic economic infrastructure. As we see in the still continued great margin of poverty among nearly three-quarters of the populations of leading nations with advanced agro-industrial technologies, such as China and India, the want of sufficient elaboration and distribution of truly modern forms of infrastructure expressing modern technology, makes a mockery of the search for less costly goods by runaway U.S. and European investors in what is currently called "globalization."

In such cases, we must see the lower prices of goods produced in those nations as the cause of the terrible misery within as much as seventy percent of the population as a whole. The misery is chiefly a reflection of the long-term failure to pay, and to be able to pay the necessary price of the goods produced at cheaper prices by cheaper labor.

This is reflected in the terrible degree of collapse of the internal economies of the U.S.A., Europe, and others under the so-called "floating-exchange-rate" monetary system of today's International Monetary Fund (IMF) and World Bank. During these three decades, since approximately the mid-1970s, we have cheapened the price of goods consumed within the U.S.A. and Europe, by exporting production to regions of the world where production is cheaper.[20] The

20. In the U.S.A., for example, the net physical standard of household income of the lower eighty percentile of the population, has fallen rather continuously since approximately 1977. Since the U.S. has been incapable of reaching "third world" conditions within its present population-stock, it now imports masses of extremely poor as both legal and illegal immigrants from below its borders.

Globalization's child labor in Honduras. "As a result of this practice of so-called 'globalization,' the potential population-density of the planet is being driven toward levels far below the present level of world population. Globalization is, therefore, the practice of genocide, as in Africa, but also on an increasingly global scale."

cheapness is the fruit not only of low wages paid in those other nations, but, more significantly, in the lack of the costs of modern forms of basic economic infrastructure.

Therefore, the financier interests controlling this shift in the world economy demand both savagely lower wages for the general populations of the nations to which production has fled, but they also insist upon the suppression of the cost of providing modern basic economic infrastructure in these new markets, while destroying the productive basis in formerly industrialized powers such as those of the U.S.A. and Europe.

In the meantime, in the attempt of Europe and the U.S.A. to compete with the cheaper production they have engendered in nations with much lower standards of household income, the governments of Europe, the U.S.A., and others, have connived to—in effect—slash their own economic throats, by pushing the prices of labor and investment in infrastructure, down toward "Third World" levels, while, at the same time, driving the prices of goods produced abroad lower, and lower, and still lower, by transferring production from already poor nations of the cheap labor markets, toward nations with the worst imaginable conditions of national life.

As a result of this practice of so-called "globalization," the potential population-density of the planet is being driven toward levels far below the present level of world population. Globalization is, therefore, the practice of genocide, as in Africa, but also on an increasingly global scale.

Much could be said and written of the minds and morals of those influential circles who have concocted and foisted that policy of practice upon our planet. However, for the moment, let us treat this as a scientific fact, as a matter of manifest and massive foolishness, rather than evil intentions.

If this trend, called "globalization," were to be continued, we would reach a critical point, a phase-shift, of self-accelerating physical economic decline globally, at which the potential (e.g., "sustainable") population of the planet would decline to approximately the present population of China, or much less, within a generation or so. Look at the role of investment in basic economic infrastructure in that perspective. Already, throughout most of the world, including the U.S.A. itself, human life itself is becoming very cheap, with that price dropping at a currently accelerating rate. If this continues, a point of phase-shift will be soon reached, at which the level of population will also begin to collapse, and that at an accelerating rate.

All of this global downturn has been concentrated within the most recent four decades, since about the time Harold Wilson assumed the post of Prime Minister of the United Kingdom, since about the time Zbigniew Brzezinski emitted his late 1960s draft for a "technetronic revolution," since about the time of the eruption of the ultra-decadent "68ers" of the "rock-drug-sex counterculture" and that decadent culture's popular fads of LSD, marijuana, and the like.[21] This change, which was first implemented, most

21. This plunge into decadence, while triggered by the U.S. war in Indo-China and other factors of the middle to late 1960s, was not so much a product of the 1960s, as it was a reflection of the impact of the influence of the counter-cultural Congress for Cultural Freedom on the education and other relevant circumstances of life of the children and youth of the 1950s, especially the suburban population of that time. Vietnam was the detonator, but

notably, in the economies of Europe and the Americas as the highly touted "cultural paradigm-shift" of the recent four decades, is the key to understanding how once powerful and increasingly prosperous nations, such as those of North America and Europe, have also willfully destroyed themselves during the course of these four decades to date, and have gone so far into lunacy as largely praising themselves for making this change.

Otherwise, the pattern of "globalization" which I have just summarily described so, can be studied usefully from a different vantage-point, that of Vernadsky's notion of the Noösphere.

The level of the productive powers of labor achieved through technological progress, is not determined solely by the quality of the technology expressed by the process of farming or manufacture. The productive powers of labor expressed in the process of production of a product for market, are largely, even chiefly determined by the role of the basic economic infrastructure provided as the environment of the acts of production of consumable objects purchased. This basic economic infrastructure is expressed both as the necessary environment of production itself, and as the necessary environment of the population engaged in that production.

When those factors are taken into account, cheaper labor in so-called developing nations is not actually a means for lowering the net physical cost of maintaining the world at a present level of potential relative population-density.

One source of complications which tend to mask the physical realities of "outsourcing," is the difference between current price and the price of the same goods produced and sold under conditions in which the economies of the world taken as a whole were actually engaged in long-term net growth, as tended to be the case during the first two decades in post-war Europe and the Americas, for example. That earlier experience must be compared with what is now shown to have been a long wave of net decline in those regions, a presently persisting decline which began at varying points, from case to case, during the more recent four decades.

The reality of the past four decades begins to be demonstrated forcibly when we take into account the loss of modern production facilities, the falling physical standard of living of the population of a nation considered as a whole, and the rising demand, that costs which nations formerly paid, are being cut, cut, cut, and cut again. It is as if governments, such as that of the Second Administration under U.S. President George W. Bush, Jr., were telling their people, "We are reaching the point that we can no longer afford to keep you alive." The savage cuts in pensions and health care in the U.S.A. and western Europe, are typical of this morbid trend.

What we have termed "basic economic infrastructure" is not only an essential part of the cost of production of a nation's salable output of commodities. The level of technological development and physical capital-intensity of investment in infrastructure is itself a multiplier of the productivity of labor employed in the fabrication and distribution of agricultural and manufactured products.

Step back one step. The lowering of the physical cost of production of goods through scientific and technological progress occurs as much in the form this progress is incorporated in investment in basic economic infrastructure, as in the direct costs of production and distribution of manufactured and distributed agricultural and manufacturing product.

Thus, by shifting production to poorer countries, while allowing the rot and discard of infrastructure and production in nations such as those of North America and Europe, we have lowered the net per-capita output of the world as a whole, by lowering the net level of technology expressed as both basic economic infrastructure and the production of marketable goods. We wreck the nations, such as the U.S.A. and Europe, which had the highest relative concentration of investment in maintenance and improvement of productive technology and related basic economic infrastructure, while relying upon production by a small fraction of the total population in so-called developing economies, "developing economies" in which the technological level of production and standard of living is typically low, even very low. What it has become fashionable to describe as "globalization" has been a process of what has become a factually undeniable collapse of the productivity of the planet considered as a whole.

Since the useful physical life-span of much of the basic economic infrastructure on which modern life depends, runs in the order of between one and two generations, the nearly four decades of increasing neglect of replacement and repair of basic economic infrastructure has brought much of the world, North America and Europe most notably, to a much lower level of productive potential than during the 1960s. The time has come at which worn-out infrastructure, and lost investment in modern agriculture and industry, must be replaced rapidly, on a vast scale, or there will be a sudden collapse of productive potential to levels far below that prevalent up to this moment. This approach to the closing phase of a long-term capital cycle, in relevant sections of the world, now defines a precipice for the world economy as a whole during the times immediately before us. Unless there is a sudden, drastic shift back to heavy investment in basic economic infrastructure, the apparently slower long-term decline in economy experienced during recent decades will soon be jolted by a relatively precipitous rate of physical decline, even a collapse.

Economy and the Noösphere

Now, reconsider the following from among those excerpts from Vernadsky's 1935 paper which I quoted at the outset of this report. Reconsider the formulation, now slightly modified: *It,* cognition*, defines the way in which society (i.e., the*

the 1950s influence of the Congress for Cultural Freedom was the explosive cultural charge which was exploded as the "68er" syndrome. The hypocrisy of the parents of 1950s suburbia matured as what was, potentially, the culturally fatal sophistry all too typical of their children, the "68ers."

Noösphere) organizes the flow of both abiotic and organic materials which it absorbs, uses, and discharges. Compare my own views with those stated by Vernadsky for the case of the Biosphere.

For this purpose, I shall interpolate some restatements, as comments, here, of some of the points I have made above. By repeating them in this way, we may hope to make clearer to the reader what I have already stated on this matter above.

For example, quoting and slightly paraphrasing Vernadsky:

"If this structure is called a mechanism, it would be a special, very peculiar mechanism, a continuously changing mechanism—a dynamic equilibrium—never reaching a state strictly identical in the past and in the future. At every moment of the past and of the future time the equilibrium is different but closely resembling. It contains so many components, so many parameters, so many independent variables, that no strict and precise return of some state in its previous form is possible. An idea of it may be given by comparing it to the dynamic equilibrium of the living organism itself. In this sense it is more convenient to speak of the *organized state,* rather than of the *mechanism* of the biosphere."

Let us apply this image to the economy as I have described it in the immediately preceding pages. Instead of regarding an economy as charlatans such as Mandeville, François Quesnay, Adam Smith, and Jeremy Bentham have done, consider an economy as a kind of organism. This time, consider it as an organism of the Noösphere, rather than the Biosphere.

"Life," in this case the principle of creative reason, "is continuously and immutably connected with the" Noösphere, and also the subsumed "biosphere. It is inseparable from the latter materially and energetically. The living organisms are connected with the biosphere through their nutrition, breathing, reproduction, and metabolism. This connection may be precisely and fully expressed quantitatively by the migration of atoms from the biosphere to the living organism and back again—*the biogenic migration of atoms.* The more energetic the biogenic migration of the atoms, the more intense is life," or, in this case, cognition. "It," in this case, of economy, "is nearly dying out or hardly flickering in the latest phases of life, the importance of which in the organized state has not yet been evaluated, but should not be overlooked.

"The biogenic migration of atoms," or in this case, the materials produced and consumed by the integrated economic process of society as a whole, "comprises the whole of the biosphere, and is the fundamental natural phenomenon characteristic of it.

"In the aspect of historical time—within a decamyriad, a hundred thousand years,—there is no natural phenomenon in the biosphere more geologically powerful than," in this case, human "life."

"The chief geological importance of these masses of substance embraced by life," in this case physical economy, "that seem small when compared to the mass of the biosphere, is connected with their exclusively great energetic activity.

"This property of the living substance," in this case, cognition, "having nothing equal to it in the substance of the planet, not only at the given moment, but also in the aspect of geological time, completely distinguishes it from any other earthly substance and makes the distinction between the living and inert substance of the planet quite sharp, the more so that all the living is derived from the living. The connection between the living and the inert substance of the biosphere is indissoluble and material within the geological time—of the order of a milliard of years, and is maintained exclusively by the biogenic migration of atoms. Abiogenesis is not known in any form of its manifestation. Practically, the naturalist cannot overlook in his work this empirically precise deduction from a scientific observation of nature, even if he does not agree with it due to his religious or philosophically religious premises."

"The whole work of the Laboratory," in this case, my discoveries and their use in economy, "is based on such a structure of the" Noösphere, "on the existence of an impassable sharp, materially energetical boundary between the" cognitive "and" non-cognitive "substance."

"It is necessary to dwell on this point, since it appears to me that in this question there is a vagueness of thought, which impedes scientific work." Such is the situation in the practice of economy by nations today.

"We do not proceed here beyond exact empiric observation, the deductions from which are obligatory for the scientist and as a matter of fact for every one; it is on this observation that he not only *can* but *must* base his work. These deductions may possibly be explained differently, but in the form of *empiric generalization* they are to be taken into consideration in science, for an empiric generalization is neither a scientific theory, nor a scientific hypothesis, nor else a working hypothesis. This generalized expression of scientifically established facts is logically as obligatory as the scientific facts themselves—if it has been logically correctly formulated." It is the same for economy today.

"The sharp material energetic distinction of the living organisms in the biosphere—of the living substance of the biosphere—from any other substance of the biosphere penetrates the whole field of phenomena studied in biogeochemistry." It is the same for the Noösphere.

Here, the application of Dirichlet's Principle to the physical processes of economy shines forth. For this purpose, we shall replace the use of the term "life," by "cognition." Both terms are cognates of *creation.* One as applied to the principle expressed by living processes; the second as a higher order of creativity, cognition as defined by man's experimentally validatable discovery of a universal physical, or equivalent principle. In place of Vernadsky's "the biogenic migration of atoms," we have "the cognitive migration of materials."

If we apply that standard for the healthy, normal state of the Noösphere to the evidence of Earth's economy during the recent forty years, especially since the election of President Richard Nixon, we would be obliged to describe the political-

economic doctrines of practice of the U.S. economy, and also that of Europe, since that time as clinically insane. The criteria of the cheapest price and highest rate of financial profit have not only failed, but have shown themselves the worst imaginable sort of threat to the future of the human species, and economists of that persuasion defined as a failed species.

Let us, therefore, take the cited 1935 criteria of Vernadsky for the Biosphere as a standard of comparison. Let us adopt the intention to investigate the nature of those pathological features of the recent three and a half decades of the U.S. economy from that vantage-point. We proceed as follows.

The difficulty we face in treating the subject of human creativity, as Vernadsky faced a similar problem of method in his defining the Biosphere, is that, just as the principle of life which is expressed by living processes, is not found within the province of biochemistry, the power which orders the creative powers of the individual human mind are not biological processes as such. In both instances, we are confronted by something which is universal, and physically efficient, but intangible to the senses.

It is not accidental that problems of this type could not be addressed effectively by an Euler, Lagrange, or other empiricists. When these gentlemen set out to deny the existence of the infinitesimal in Leibniz's catenary-cued calculus of the universal principle of physical least action, they eliminated attention to those discontinuities which betray the presence of a universal physical principle, principles of a type which Classical Platonic Greek science found in Archytas' construction of a solution for the doubling of the cube. Such knowledge can not be reached by any ordinary inductive method, certainly not by the methods of the reductionist inductive-deductive "sciences."

We can, indeed, often recognize the presence or absence of what is properly named human creativity once we have the hang of conducting such investigations, but our knowledge of the principle of intellectual creativity is limited to a kind of evidence similar to Vernadsky's reference to the Biosphere. Hundreds of thousands of years' accumulation of the fossils of the Biosphere, approximate universality in ways which permit systematic investigation of the way in which a principle of life expresses its footprints. In human creativity, the fossils of physical scientific progress work to similar effect.

The work of such outstanding Renaissance figures as Brunelleschi and Leonardo da Vinci has pin-pointed elements of discovery in artistic composition which, fortunately, if seemingly coincidentally, are verifiable as such by physical-scientific methods. When the cross-voice relations within Classical compositions in J.S. Bach and such followers as W.A. Mozart and Beethoven are adduced by demonstration in performance, creativity can be precisely defined in the medium of musical composition. In general, when the forms of ambiguity which are rightly presented as ironies are shown to point to a verifiable truth not otherwise accessible to conventional use of language, a similar proof can be adduced.

In language, as in art, just as life as such seems inaccessible to the senses, it is generally impossible to convey important discoveries by literal use of an established habit in employment of a language. Only a creative intellect can discover the existence of creativity. Creativity can be communicated only by prompting the activation of the creative powers specific to the individual human mind. However, even the dumbest of beasts, or of U.S. Presidents could feel the force unleashed by that human creativity. Thus, it is a fine point of Mosaic theology, and the theology of Plato's ***Timaeus,*** that only man can know the unseen God, although the universe must feel His effects.

In other words, can we know the principles of a sane economy by applying the methods which Vernadsky applied to the Biosphere, to the economy defined as an expression of the Noösphere? The question is thus posed: would we then be using the model of the Noösphere as a trick for understanding the economic process, or is it also the case, that knowledge of the physical economy, viewed in this way, is indispensable for probing the Noösphere with a precision lacking in the methods actually developed in any record of the work by Vernadsky?

3. Ancient and Modern Society Today

The most significant scientific problem to be faced in efforts to define society for these purposes, is that the modern society has systemic characteristics which do not exist in ancient and medieval forms of European society. Moreover, the prevalent practices of national economies today are an awkward mixing of modern economy with a superimposed relic of medieval society.

The chief common problem of today's study and application of a habit called "economics," is that the prevalent, worldwide view of the subject itself has been shaped by that tradition of Venetian financier-aristocratic usury whose product is known today as the intrinsically imperial Anglo-Dutch Liberal system. This view is typified by Mandeville's Enron-like promise that great good can come only from the unhampered proliferation of small-minded private acts of evil. What, then, if we put aside the superstition that the interest earned on loan of money is the Cain-raising Adam and Eve of economy? Why should we tolerate the existence of a creature which has shown itself the author of such pernicious doings as wild money has often done, as with the pestilence of financial-derivatives speculation today, and that on a tremendous scale, now an absolutely unpayable sum, many times greater than the total annual product of the planet as a whole?

This Anglo-Dutch Liberal financial system on which the fanatical doctrines of our contemporary monetarists are premised, is most explicitly a relic of a form of medieval society known as the ultramontane system, established as an alliance of the medieval Venetian financier-oligarchical system with

the Norman chivalry. Like ancient society, medieval ultramontane systems subordinated the great majority of the population to the status of human cattle, defining social relations in a way echoed by the argument on behalf of the dogma of *laissez-faire* of the Physiocrat François Quesnay. Quesnay's argument, from which the British East India Company's Adam Smith derived his "free trade" dogma, was, as I have already emphasized above, an echo of the doctrine of the Olympian Zeus from ***Prometheus Bound,*** insisting that mankind not be permitted to have knowledge of the use of "fire"—i.e., universal physical principles.

In the contrary form of society, the modern sovereign nation-state republic otherwise named a *commonwealth,* the principle of organization is called *the general welfare principle.* In this organization of society, the ideas corresponding to fundamental principles of science circulate more or less freely and abundantly in society. Thus, in the typical ancient and medieval society, the noëtic principle is not the characteristic mode of organization of the society as a whole, whereas, in that modern European sovereign republic which is sometimes referred to as a commonwealth, the noëtic principle is the characteristic form of action within the social process.

Although the principle of the republic committed to the promotion of the general welfare is ancient knowledge, as the cases of Solon of Athens, Socrates, and Plato typify this, the constitution of nation-states based upon the principle of progress in the promotion of the general welfare dates from the Fifteenth-Century Renaissance and such exemplary cases as France under Louis XI and the application of Louis's principle by England's Henry VII.

The situation became complex with the resurgence of the power of the Venetian financier-oligarchy as a result of the Ottoman conquest of Constantinople. From the expulsion of the Jews from Spain by the Inquisition in 1492, until the 1648 Treaty of Westphalia, the Venetian faction used religious warfare and persecution, as in Karl Rove's Flagellant-like political following in the U.S.A. today, as a weapon to divide the emerging modern European nations against one another. The weakening of the power of Venice as a state power during the Seventeenth Century led to the continuation of the Venetian model of quasi-imperial rule by the Dutch and English India Company models based on the special doctrine, called empiricism, of Venice's Paolo Sarpi, a doctrine which has dominated world finance, and the popular ideology of Europe and other locations, since the February 1763 Treaty of Paris where London's imperial supremacy was first established in the interest of the British East India Company at that time.

The model modern form of sovereign nation-state republic for today was established with the 1789 U.S. Federal Constitution; but, the chain-reaction effects of the French Revolution and Napoleonic rule and ruin, combined with Anglo-Dutch Liberal corruption, isolated the young U.S.A. for an extended period, until the U.S.'s emergence as a world power during 1863-1876 and its emergence as a leading world power under President Franklin Roosevelt.

Thus, we have two leading "models" of European-style economies today. The Anglo-Dutch Liberal imperial system of international financier-oligarchical hegemony, into which the U.S.A. itself has been, unfortunately, significantly assimilated, versus the true modern nation-state system typified by the often mis-used principles on which the U.S. Constitutional system was founded. In the latter system, we have the basis for what might be termed a Vernadskyian model of Noösphere republic. The process of "globalization" which is threatening the extinction of civilization today, is a product of that Liberal tradition.

The complication arising between the two systems, the American System and the Anglo-Dutch Liberal system, is the fact that the role of technological progress has persisted until now as a determining economic and also military strategic factor, as the U.S. demonstrated during the 1939-1945 war. This factor has been such that nations under the Anglo-Dutch Liberal model, which are naturally better fit by ideology and temperament for a quasi-feudal form of society, than a modern, scientifically progressive agro-industrial culture, have nonetheless been unable, until now, to free themselves from a strategic compulsion to maintain society on the basis of a commitment to continuation of scientific-technological progress. The attempt to consolidate the form of imperialism called "globalization," is an effort to rid the world, once and for all, of everything which modern European civilization had accomplished.

Thus, we must face the ugly truth, that the post-1964 rise of the "rock-drug-sex youth-counterculture" and the insurgence of "environmentalism," represent an effort of the neo-Venetian, Anglo-Dutch Liberal interest to free itself from the strategic threat which scientific-technological progress constitutes for an attempted continuation of financier-oligarchical hegemony.

Since 1789, the principal alternative to the Anglo-Dutch Liberal model has been what is known as the American System of political-economy, a system which is implicit in the composition of the U.S. Federal constitutional republic.

If the U.S. now comes back to its senses, pulling back from the terrible holocaust which the architects of the American oligarch George Pratt Shultz's Bush II Administration have unleashed, we have one last chance to stop the plunge toward global Hell. If we succeed in doing that in the U.S.A. itself—with whatever cooperation we might find for that noble enterprise—the mission of a community of perfectly sovereign nation-states will be to use the U.S. revolutionary model of 1789 as the rallying point for a system of international cooperation among sovereign states, a system we might have had but for President Franklin Roosevelt's most untimely death.

Then, the ideas associated with Vernadsky's conception of Biosphere and Noösphere will provide a needed added guidance for new global forms of cooperation among sovereign commonwealths. Then, the ideas expressed and otherwise reflected in the foregoing pages will become a possible reality for mankind as a whole.