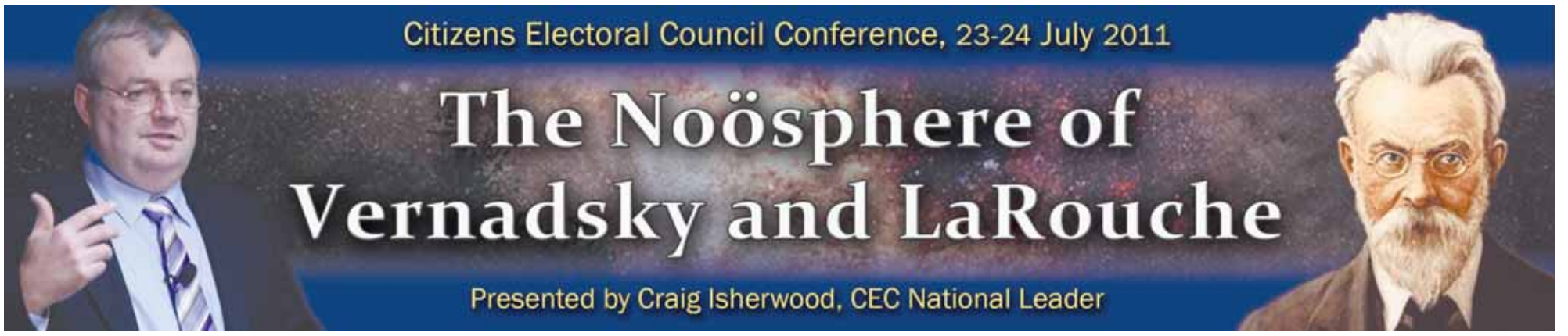


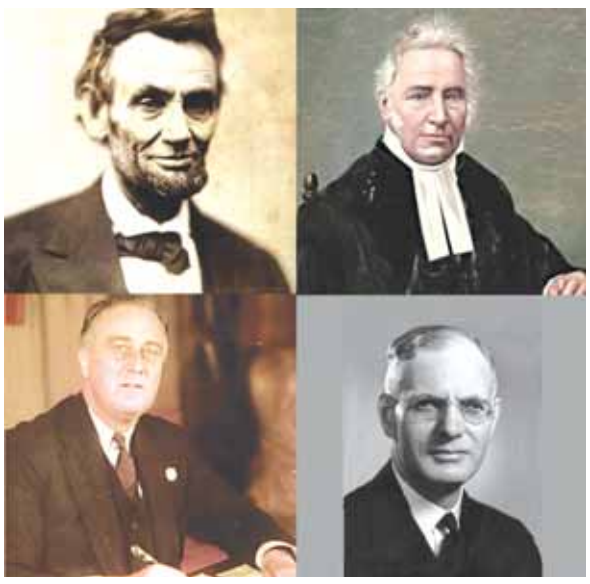
This afternoon, I want to introduce you to a man whose work has been mentioned by Lyndon LaRouche on many occasions as crucial for all mankind, and who is a current focus of the LaRouche PAC Basement team.

He is the Ukrainian-Russian scientist Vladimir Ivanovich Vernadsky, founder of the new branch of science known as biogeochemistry, which focuses on the effect of life on the chemistry of the Earth. As most of you have been around for quite some time as key activists in our organisation, you most probably recognise him as the person Mr. LaRouche refers to as defining the Universe we live in as having three distinct phase-spaces: the inert, the biotic or living, and the noetic—the realm of human reason.

Mr. LaRouche refers to Vernadsky in every one of his papers, as these specific discoveries by Vernadsky, these phase-spaces, are the true character of the world in which we live—not the one that the greenie environmentalists believe we live in and are destroying. Since we all too often take what Mr. LaRouche writes and says for granted (and no one ever does that, do they?) and skate over such concepts—accepting them *a priori*, that is, without question—the purpose of my presentation this afternoon is to give you a real sense of the importance of Vernadsky's work: a living, working understanding of his crucial ideas and approach.

A Scientist's Life in a Time of Upheaval

Vernadsky's life spans an extraordinary period of human history. Those of you who have studied the DVD titled *1932* are familiar with it. Think of the span from the U.S. Civil War to the end of World War II; from Abraham Lincoln to Franklin Roosevelt in the USA, or, in Australia, from John Dunmore Lang to John Curtin. Vladimir Vernadsky was born into a family of Ukrainian intellectuals living in St. Petersburg, Russia in 1863, two years after Tsar Alexander II's emancipation of the serfs. He died in the Soviet Union in the last year of World War II, 1945.



Vernadsky's life reached from the time of Abraham Lincoln and John Dunmore Lang (top), to that of Franklin Roosevelt and John Curtin (bottom).

During his lifetime came the horrific, worldwide upheaval of World War I, which was caused by the British Empire's fearful and brutal response to the threatened spread of American System nation-building economics throughout continental Europe and beyond **(see page 37)**, jeopardising the entire British Imperial system of colonial enslavement and looting. Since British geopolitics hinged on pitting Germany against Russia, the Russia in which Vernadsky lived was devastated repeatedly during this time. The more than 100,000 casualties Russia suffered in the Russo-Japanese War of 1904-05 and the 1905 Revolution were just the beginning. Russia lost close to five million people in World War I, then 10 million more in its 1918-21 Civil War: combined, that was already eight per cent of an estimated 175 million population in the Russian Empire in 1913. Then came the upheavals of the Soviet period, with 15 to 20 million killed in famine and internecine strife (much of it instigated or manipulated from the outside), and another 20 to 30 million dead in the Second World War.

Vernadsky's moral integrity in pursuing scientific breakthroughs for the benefit of his own country and all mankind, in the setting of such a holocaust, is breathtaking. From every standpoint—scientific, moral, and political—he is a towering figure, one of those, like Dante Alighieri in 1300 or Leibniz at the turn of the 17th to the 18th century, with whom LaRouche has been conducting a living dialogue throughout his own intervention into history.

Accordingly, it is no surprise that throughout his life, during all the time Vernadsky was working on the scientific matters I shall outline this afternoon, he was simultaneously, and often in connection with them, intensely involved in shaping the economic policy of his country.

The DVD *1932*, available from the CEC, exposes the nature of the British Empire that brought two world wars.

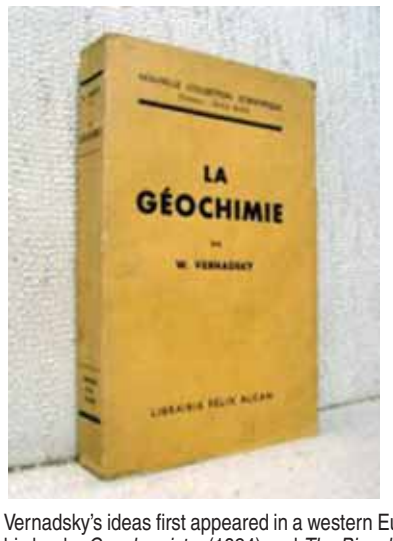
Bringing the Biosphere and Noösphere Concepts to the World

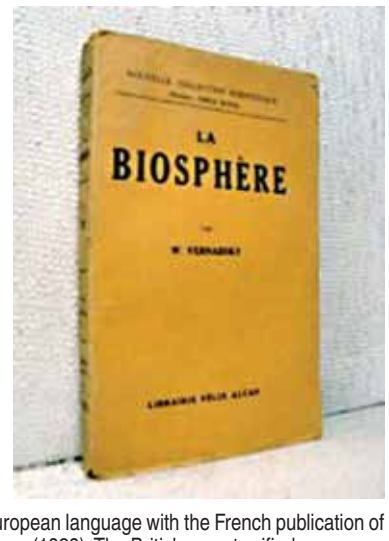
Studying his life, I think Vernadsky's scientific work can be roughly divided into two periods. They are not discontinuous from his scientific viewpoint and they do not coincide exactly with the shift of power inside Russia in 1917, but I want to define them around the period of 1922-24, when Vernadsky found a new focus in his own scientific work, and also that work provoked major reactions from others, especially the British enemies of science.

The first period of Vernadsky's scientific work extended from his early studies in Russia up until his lectures at the Sorbonne (the University of Paris), in France, in 1922-23, and the time he spent with Marie Curie during this visit. Whilst in Paris, in 1924, Vernadsky published his first major work in a Western European language, the book *La Géochimie* ("Geochemistry" in French). Slightly later his book *The Biosphere* came out in Russian (in 1926) and French (in 1929). This represented the liberation of Vernadsky's ideas in a more profound and direct way into world thought.

La Géochimie was written from his lectures at the Sorbonne in geochemistry and mineralogy, presenting the accumulation of his work to that date. The lectures included his conception of the unique nature of life and living matter in the "Biosphere". In them Vernadsky also talked about "a new fact in history, which did not exist in earlier epochs: the activity of civilized man". In other words, Vernadsky's lectures contained the germ of the concept he later called the "noösphere", the higher domain of human cognition and creativity.

To give you an idea of the power of the ideas Vernadsky was presenting, I want to cite an excerpt from his *Essays on Geochemistry*. This is from a section called "Geochemical Activities of Man", contained in a 1967 edition published in the Soviet Union, and issued in English translation in 2007. The exact date when this passage was written is not known, but the editors identify the *Essays* as an assembly of writings between 1922 and 1933. So, it characterises what Vernadsky was presenting in its essence at the Sorbonne, and which terrified the enemies of science and of humanity. He uses the term "psychozoic," from the Greek words for "mind" + "animal", thus presenting the noösphere. You will also hear the Latin *Homo sapiens*, the name of the human species, which means "knowing man", and the word "*faber*", meaning "maker", like the word "fabricate".





Vernadsky's ideas first appeared in a western European language with the French publication of his books *Geochemistry* (1924) and *The Biosphere* (1929). The British were terrified.

"[I]n our geologic era, in the psychozoic era—the era of reason—a new geochemical factor of paramount importance appears. During the last ten or twenty thousand years, the geochemical influence of mankind, which has captured green living matter by means of agriculture, has become unusually intense and diverse. We see a surprising speed in the growth of mankind's geochemical work. We see a more and more pronounced influence of consciousness and collective human reason upon geochemical processes. Man has introduced into the planet's structure a new form of effect upon the exchange of atoms between living matter and inert matter. Formerly, organisms affected the history only of those atoms that were necessary for their respiration, nutrition, and proliferation. Man has widened this circle, exerting influence upon elements necessary for technology and for the creation of civilized forms of life. Man acts here not as *Homo sapiens*, but as *Homo sapiens faber*."

The unleashing of ideas like this by Vernadsky in this Paris period caused a major freak-out amongst the thought police of the British Empire, because that's what Bertrand Russell and H. G. Wells and their circles were. As you have heard from the reports from the other presentations, they were already in an uproar against the revolution of dynamics in physical chemistry since the end of the 19th century. Now, here came Vernadsky, from the country of Russia which was supposed to have been taken over and/or destroyed in the conflagration of World War I, with powerful and true insights that could completely overthrow the doctrines of "ecology" and "eugenics", that is, the pseudoscience that says Man is nothing but an animal, which the British were pushing intensely in the wake of World War I.

In the second period of his work, from around 1924 until his death in 1945, Vernadsky developed his conceptions of the biosphere and the noösphere in ways that had both immediate practical application and profound implications for the future development of mankind. Provoked by his discussions with Marie Curie about the uncompleted work of her husband Pierre Curie, especially on symmetry, and the dissymmetry characterising what Curie called a different "state of space", he delved into the question of what could be the substrate, what could underlie the three phase-spaces of existence that he was studying. So, Vernadsky for the rest of his life was investigating fundamental principles of the Universe. He explored the ontological nature of space and time in their relationship with living and non-living processes. ("Ontological" means having to do with that which exists, and the questions of how and why what exists, does exist.) Vernadsky was very familiar with the work of Louis Pasteur on the left- and right-handedness of molecules and crystals, which he brought into his own investigations of the nature of space and time.

As we'll see, Vernadsky's ideas ran counter to what became the official ideology of the Soviet Union, called "dialectical materialism". In fact, the attacks on Vernadsky within the Soviet Union for violating "dialectical materialism" were nothing but a subset of the overt and covert attacks on his ideas by the British outside the Soviet Union, since the Communist Party's "materialist" ideology descended directly from the influence of the Fabian Society's Friedrich Engels, in particular, within Marxism. In his speeches and discussions during visits to post-Soviet Russia, since the 1990s, Lyndon LaRouche has often emphasised Engels's Darwin-flavoured fixation on the human "opposable thumb", the fact that humans can reach the thumb across the rest of their hand and grab something, as being the key to economic progress. This notion is a dead giveaway for how Marxist economics and dialectical materialism were spin-offs of the same old, tired British reductionist, anti-human doctrines about how the world works.

Believe it or not, the "opposable thumb" is not the key to economic progress.

Patriot and World Citizen

Vernadsky fought and polemicised against those attacks in the Soviet Union, but it is important to realise something else, something that is crucial to what a towering moral figure he is, which has everything to do with why he was such a great scientist.

After the horrors of World War I, the British-manipulated Russian Revolutions of 1917, and the Civil War—remember: an absolute minimum of eight per cent of the whole population has been wiped out—there was a situation in which educated Russians, the cream of the famous Russian "intelligentsia", emigrated to the West in droves. The pressure on Vernadsky to leave his homeland was immense. He himself was arrested and interrogated in the summer of 1921. Later, during the manipulated purge trials and mass executions in the Soviet Union in the 1930s, Vernadsky's life was constantly in danger. He was accused of "idealism" at a time when people were routinely being shot, or exiled to the labour camps in Siberia, on the pretext of being for "idealism" and against "dialectical materialism".

Under those conditions, why did Vernadsky return to the USSR in 1926? Why did he stay? Not only did Vernadsky not leave his country; he also continued making world-historical breakthroughs in science and

a critical contribution to the development of the economy of Russia and Ukraine (of the entire Soviet Union, really), including things such as the Atom program—the Soviet nuclear program. He was key to the survival of the Russian Academy of Sciences, founded by Tsar Peter the Great under the guidance of Leibniz in the early 1700s, as a crucial institution within the Soviet Union. He also created the Academy of Sciences of Ukraine. And he ensured the survival of another key institution, which he himself had led under the Tsarist government during the War: the Commission for the Study of Productive Forces, known by its Russian acronym KEPS.

Among other things, it is clear that the Soviet ruler Joseph Stalin protected Vernadsky, having an appreciation that his ideas and work were vital to the survival of that country. At the same time, it is fairly clear that Vernadsky believed that his work in Russia and Ukraine, and the survival of their whole scientific tradition, not to mention their resources, was important for mankind.

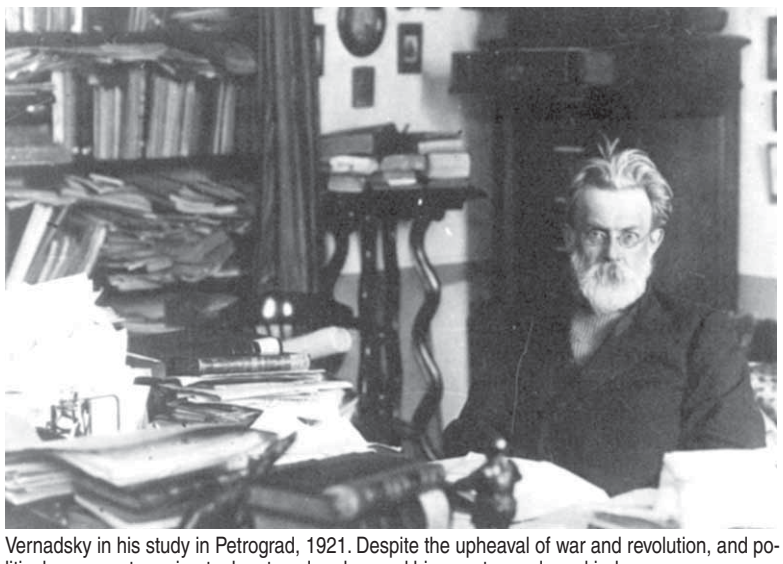
Thus, Vernadsky combines the qualities of patriot and world citizen; of patriot, and world-historical scientist. Lyndon LaRouche wrote about that in the 1996 article "Russia's Relation to Universal History: Letter to a Russian Friend". There, LaRouche said:

"As typified by the case of the great Vernadsky, the Bolsheviks adopted some of the tradition of the Russian intelligentsia's best statesmen and poets before them: they sought to erect a society, in imitation of that modern nation-state form first established by France's Louis XI, a society echoing that design wrought by the founders of the U.S. Federal Republic of 1789: premised upon universal citizenship, with leading emphasis upon establishing a quality of universal education essential to a society increasing its productive powers of labor through investment in scientific and technological progress. The case of biogeochemist and nuclear scientist V.I. Vernadsky, typifies the relevant point: No truly sentient observer could deny, that in the areas of physical science, including biology, Soviet Russia made durable contributions to mankind's history."

LaRouche continued, referring to Vernadsky's sometimes life-and-death struggle:

"Like all societies emerging from prolonged dark ages… Russia stumbled into the modern world, haltingly at first, as a 'two tier' society. It came out of an habituated cultural tradition, in which the institutions integrated with feudalism had worked … to keep each section of the population in its assigned place … V.I. Vernadsky's political difficulties, under Czarism and also during significant parts of Soviet history, typify this. He was not so much a dissident within the Soviet system, as a dissident within all expressions of modern Russia's inherited cultural backwardness. He is typical, thus, of that moral quality which distinguishes a true creative-scientific mentality: he hates that which crushes the creative potential of the individual human personalities."

Throughout this latter period, Vernadsky more and more elaborated the idea of the noösphere, that mankind was becoming the most powerful geological force on the planet because of his unique powers of reason and creativity. Whilst his work was left unfinished in many areas, the concept of the noösphere has been continued by Lyndon LaRouche. Think about Mr. LaRouche's fight against British and Marxist economics, which say that wealth comes from 1) the bounty of nature, or 2) free trade, or 3) the "horny hand of labour" with its opposable thumb. LaRouche's Physical Economy demonstrates that the source of wealth is human creativity. That is, the noösphere.



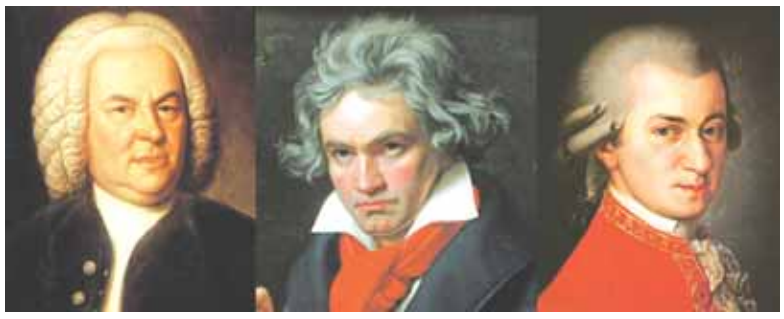
Vernadsky in his study in Petrograd, 1921. Despite the upheaval of war and revolution, and political pressure to emigrate, he stayed and served his country, and mankind.

Sufficient Reason

This afternoon I am going to go into a fair amount of detail about Vernadsky's beautiful discoveries, to demonstrate that the Universe does conform to Leibniz's idea of the "principle of sufficient reason", and not the boring idea of Newtonian space that is empty and operates on the basis of purely mechanistic laws, directed by a Creator who stands outside the Universe with a big whip to keep it running when it winds down.

The principle of "sufficient reason" is something Vernadsky knew very well. He was always searching for the causes of the new phenomena he had discovered.

At one point in discussions with Elisa Barwick about Vernadsky, in preparation of this talk, I complained that Max Planck, Einstein, Leibniz and Pasteur seemed to have no hesitation in talking about theological concepts such as "God," while Vernadsky seemed never to mention God, or any religious ideas at all. I wondered if he had the same understanding of the principle of sufficient reason as did Leibniz and those other scientists I mentioned before. Or, was the problem that in Soviet Russia you could be killed for talking about God?



Left to right: Johann Sebastian Bach, Ludwig Beethoven, Wolfgang Amadeus Mozart. Vernadsky said they "penetrated 'to the depths' non-verbally".

A postscript to his correspondence with a young geologist, when he was 77 years of age, gave me the answer. Vernadsky said:

"P.S. Now I simply don't think in philosophical terms, when I proceed in science. 'Spiritualism' for me, verbally expressed, is clear unreality. I believe that in my scientific work I penetrate so much more deeply, nonverbally and unconsciously, than do these philosophers and religious mystics in their verbal cogitations. It's like some musicians—Bach or Beethoven or Mozart, or others—who penetrated 'to the depths' non-verbally."

Vernadsky, it should be noted, was exposed to the great classical singing culture of Ukraine from an early age. His mother was a music teacher and sang in choruses. For him to express the principle of creativity in the way he did there, through the greatest classical musical composers, such as Bach, demonstrates that he understood the concept of the principle of sufficient reason very well, as he embraced the idea personally in his work.

In a lecture fragment from the 1920s, titled "The Principle of Symmetry in Science and Philosophy", Vernadsky also talked in musical terms about the essence of creative scientific thought:

"Any naturalist knows, or at least senses, that scientific and philosophical thought, so far, has only to a small degree brought the rules for the establishment of a scientific fact into a clear, logical system. Beyond the bounds of logical formulas lies an enormous domain of scientific creative work, whose fundamental essence is manifested in the establishment of new scientific facts. We express this domain by pointing out the significance, in the development of science, of intuition, of *a scientific sense of cadence*, of unconscious insight, and of *a sense of measure and of beauty*. These, and many other diverse and hazy expressions, correspond to one and the same phenomenon—the impossibility of fully expressing, in logical and mathematical formulas, the conditions of the establishment of a scientific fact or a scientific discovery. Each of us knows how incomplete and inadequate are all the logical and mathematical rules, developed by scientific and philosophical work over many centuries, and how they only partially correspond to reality." (Emphasis added.)

Alongside these profound considerations concerning man and nature, as I was studying Vernadsky's life and discoveries, I was also struck by how this great scientist was so involved in the politics of his time. He was active in party politics, and, more fundamentally, always championed the idea that the real development of Russia would come from the growth of the scientific, that is, creative abilities of its citizenry. As I wasn't expecting that, because I, too, had been taking Mr. LaRouche's constant references to Vernadsky too much for granted, it was a wonderful surprise. As one of the founders of the Citizens Electoral Council 23 years ago, I discovered that there are many aspects of Vernadsky's life that I can relate to, very personally.

Beginnings: Soil Science and Geological History

Vernadsky was born in 1863 in St. Petersburg. His father, Ivan, was a prominent intellectual and professor of political economy, author of the first economics textbook for Russia, who had started his academic career by winning a gold medal for his thesis on Platonic philosophy. His mother, as I mentioned, was a music teacher and singer in a famous choir. Both were Ukrainian.

Young Vernadsky was an avid reader and seeker after knowledge. Starting at the age of just 13, and over the course of his life, in order to understand original concepts and histories, he taught himself over fifteen different languages. While a teenager, Vernadsky read some of the most important books by 19th-century scientists, often in the original languages. In that way he perfected his knowledge in foreign languages, and familiarised himself with the most advanced scientific thought.

Vernadsky also happens to have shared something with Marie Curie: the death of a sibling at an early age. His older half-brother, Nikolai Vernadsky, died of TB when Vladimir was 11 years old. I mention this not as a so-called human interest story, but because Vladimir Vernadsky himself said that this experience was related to his consciousness of the workings of the human mind. He wrote, later on, about how his way of dealing with this terrible grief made a life-long impact on his self-awareness of his own mental processes. As a child, he deliberately schooled himself not to have images of close relatives within his mind, because it was too painful for him to picture his beloved brother, whom he had looked up to and adored. According to associates of Vernadsky, towards the very end of his life, when he was taking the entirety of the Universe into his mind, he was able to restore this "imaging" of other people. No doubt the effort of looking over his shoulder into his own mental processes was an important one for this future developer of the concept of the noösphere—the superior realm of human cognition.

Anna and Ivan Vernadsky, the scientist's parents. Vladimir Vernadsky was 11 when his brother Nikolai (above right) died of TB.

As part of his preparation to enter St. Petersburg University, Vernadsky decided to perfect his German by reading two of Alexander von Humboldt's works, the *Cosmos* and *Pictures of Nature*. Humboldt was a leading intellectual figure of the early 19th century, and a person who sustained a colossal capacity for intense and prolonged intellectual work over his lifetime. Vernadsky became a universal natural scientist in the sense of Humboldt and Humboldt's *Cosmos*.

Vernadsky studied under great scientists: (left to right) Dmitri Mendeleyev, Aleksandr Butlerov, V.V. Dokuchayev.

Studies with Dokuchayev

At university, Vernadsky studied chemistry, crystallography, mineralogy, and other natural sciences. He had the opportunity to study under some of the greatest scientists at that time, among them the chemist and inventor of the periodic table, Dmitri Mendeleyev; the chemist and pioneer of modern structural chemistry Aleksandr Butlerov; and also the mineralogist Vasili Dokuchayev, regarded as the father of pedology, or the study of soils in their natural setting. Dokuchayev developed soil science in Russia, and was perhaps the first person to make wide geographical investigations of different soil types. His great contribution to science was, literally, to "put soils on the map". Dokuchayev was Vernadsky's university mentor for many years. (Given my background in developing poor soils in the Hervey Bay region before establishing the CEC, this is another area of real interest.)

Remember, Vernadsky was growing up and receiving his education during the worldwide scientific and industrial upsurge after the American Civil War, in which upsurge Russia was closely involved—because of Tsar Alexander II's alliance with Lincoln, and because of the role of Mendeleyev as a universal scientific mind, and—together with Count Sergei Witte—a proponent of the American system and vehement foe of British free trade looting doctrines. The serfs had been emancipated in 1861, but with burdensome conditionalities. There was a continuing backlash against Tsar Alexander's reforms from Russia's landed aristocracy (they ultimately assassinated him in 1881), an aristocracy constituted out of big families who also were historically intertwined with the British interests that were fundamentally hostile to Russia's development as an industrial nation. All the work on soil science by Dokuchayev, and by Mendeleyev himself, was related to the burning political question of what Russia's agricultural production was going to look like. Indeed, one of Mendeleyev's major goals on his trip to America for the 1876 Philadelphia Exhibition had been to gather knowledge about American research and experimentation on soils.

Reflecting on his student days under Dokuchayev, Vernadsky recalled in 1935: "While reading mineralogy at the University of St. Petersburg, I began on a path at that time unaccustomed. This was in connection with the work and contact during my student years and immediately afterward (1883-97) with the great Russian scientist V.V. Dokuchayev. He first turned my attention to *the dynamic side of mineralogy, the study of minerals through time*. ... This defined the whole course of my teaching and study of mineralogy and was reflected in my thought and the scientific work of students and colleagues." This concept of looking at geological processes through time was a crucial beginning for Vernadsky's work, as most geology at that time was only concerned with categorising minerals.

Vernadsky participated in many geological field trips under Dokuchayev, for example to the Poltava Region in Ukraine, where you have some of the richest soils on the planet: the famous Black Earth belt. Vernadsky was interested in more than just documenting the types of minerals they found: he always questioned the genesis of the minerals.

In 1886, whilst completing his university studies, he married Natalya Staritskaya—a marriage that lasted until her death

Natalya Vernadskaya (née Staritskaya) and Vladimir Vernadsky were married for 56 years.

in 1943—over 56 years. Through this long marriage, we have come to understand a lot about Vernadsky's thoughts, as he wrote frequently to his wife when away for long periods of time. After completing his university studies in 1888, Vernadsky made the first of his many travels to France, Germany and other European countries, establishing a host of intellectual contacts.

Vernadsky's son George Vernadsky, historian of Russia.

As I mentioned, Vernadsky was an intensely political person, devoted to universal education and to scientific progress for Russia, Ukraine and all nations. He was involved in the political ferment at the turn of the 20th century, and became a leading figure in the Constitutional Democratic Party. Vernadsky served on the Russian State Council in 1906-11, when Peter Stolypin was Prime Minister, and for a brief time between the February and October revolutions of 1917 he was Assistant Minister of Education in charge of all universities.

Earlier, in the 1890s, he had been involved in local government in the Tambov Region, where he had inherited a 1450-acre family property, and had taken a lead in organising famine relief during one of the deepest food crises of 19th-century Russia. Vernadsky worked on issues of educating the rural population and developing the country's intellectual culture, writing to his wife in 1893: "I am deeply convinced and become ever more convinced that the sole possibility of making culture durable is to raise the level of the masses, to make culture a necessity for them." In 1894, again writing to Natalya: "Woe to that country where knowledge is poorly developed, where it has barely penetrated the working masses."

The "Organic World"

In 1906, Vernadsky's inquiries into the role of life on our planet, the impact of life on non-living, or "inert" things such as the rocks looked at in mineralogy, began to come into focus in an explicit way. Those inquiries were rooted in his study of soils with Dokuchayev.

Writing in his diary in September 1906, Vernadsky set forth this question: "What significance has the entire organic world, taken as a whole, in the general scheme of chemical reactions of the Earth? Has the character of its influence changed in the course of all geological history, and in what directions?" Vernadsky wondered whether organisms inevitably played a role in all geochemical cycles, and asked himself what that role was.

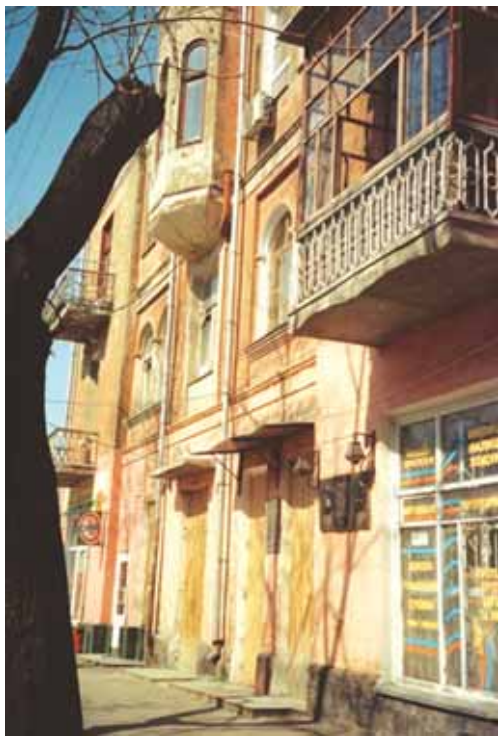
In 1908 he wrote to his son George Vernadsky, who was studying history at Moscow University: "My thought is occupied with a new area which I am embracing—about the quantity of living matter and the interrelationship between living and inert matter. With some awe and lack of understanding, I am all the same entering this new area, since it seems that I see some sides of a problem which until now no one has seen. I am succeeding here in approaching new phenomena."

Thus 1906 was a turning point at which Vernadsky turned his geologist's mind, trained to think in terms of masses, strata, and formations of matter, onto biological phenomena. He began to think about *all life,* almost as if it were a geological stratum formed from what he called "living matter"—a type of matter that was highly chemically active and different in many respects from non-living matter. Later on, he would term the layer occupied by such matter not exactly a "stratum", but "an envelope of the Earth"—the biosphere.

Here was the beginning of the ideas which, 15 to 20 years later, Vernadsky would pose dramatically in his Sorbonne lectures and in his book, *The Biosphere*. In those works, Vernadsky asked how much living matter exists, as a whole, and what is its role in the cycles of various chemical elements. He developed a rigorous scientific framework within which to characterise the biosphere. He used the concept of "natural bodies", saying that: "It is possible to distinguish between three types of natural bodies within the biosphere: Living bodies (for example, a plant, a beetle, a cow, etc.), inert bodies (for example, rock, quartz etc.), and bio-inert bodies (such as soil, lake water, rocks, and so forth). The biosphere consists of sharply bounded domains, formed by living, inert and bio-inert bodies—waters, living matter, rocks, air and so forth."

The new concept of a "bio-inert" body was developed by Vernadsky to describe bodies that are characteristic of the biosphere. They are structures consisting of inert and living bodies simultaneously (for example, soils or lake water), including matter that is now inert but was created, shaped, or put where it is, by living processes. Such zones cannot simply be treated as inert matter, as their physical and chemical properties are determined by both living and inert processes.

In defining the biosphere, rather than getting preoccupied in philosophical or religious discussions about the nature of, and debate on "life", Vernadsky posed the question, "What does life do?" He was one of the first scientists to ask what role "living matter" plays in geochemical cycles, and how living matter and inert matter differ.



A LaRouche movement delegation to Ukraine in 2009 saw the hotel (above) where Dokuchayev and Vernadsky stayed during their research visit to Kremenchug, Poltava Region in the 1880s and 1890—one of the few buildings in that city that survived the Nazi invasion during World War II. The plaque (below) commemorates Vernadsky's visits.

The Biosphere: Cosmic Origins and the Biogenic Migration of Atoms

From the outset of his development of the biosphere concept, Vernadsky was exploring not merely rocks on Earth, but the cosmic origin of the Earth and its characteristic features, especially the biosphere. The very first paragraph of his book *The Biosphere* outlines how he thought about this: "The face of the Earth viewed from celestial space presents a unique appearance, different from all other heavenly bodies. The surface that separates the planet from the cosmic medium is the biosphere, visible principally because of the light from the Sun, although it receives an infinite number of other radiations from space, of which only a small fraction are visible to us. We hardly realise the variety and importance of these rays, which cover a huge range of wavelengths. Our understanding is full of gaps, but improved detectors are rapidly expanding our knowledge of their existence and variety. Certainly they make the empty cosmic regions different from the ideal space of geometry!"

Our Earth is intimately tied to the farthest reaches of the Cosmos by virtue of the radiations that come from those far out regions. And our biosphere has developed from those radiations. Vernadsky elaborated: "The biosphere may be regarded as a region of transformers that convert cosmic radiations into active energy into electrical, chemical, mechanical, thermal and other forms. Radiations from distant stars enter the biosphere, but we catch and perceive only an insignificant part of the total; this comes almost exclusively from the Sun. [And of that we receive only one half billionth of the total solar output.] The existence of radiation originating in the most distant regions of the cosmos cannot be doubted. Stars and nebulae are constantly emitting specific radiations, and everything suggests that the penetrating radiation discovered in the upper regions of the atmosphere … originates beyond the limits of the solar system, perhaps in the Milky Way, in nebulae, or in stars [of a certain variable type]…."

Layers of soil and other surface formations down to considerable depths, seen in this soil profile, are the product of living processes.

As Vernadsky then stated: "It is living matter—the Earth's sum total of living organisms—that transforms the radiant energy of the Sun into active chemical energy of the biosphere. Living matter creates innumerable new chemical compounds by photosynthesis, and extends the biosphere at incredible speed as a thick layer of new molecular systems."

He went on to document the activity of life, that is living organisms, including the activity of microorganisms like bacteria, that of plants through photosynthesis, and then the activity of higher forms of animals. All have acted for *millions,* if not *billions* of years to transform that biosphere. Living organisms absorb and digest material (both living and inert) and solar radiation from the surrounding environment, integrate those transformed substances into their own bodies, and excrete material outside. When an organism dies, the organic material is deposited again in the environment, often in a changed location, with different combinations and concentrations of chemical elements.

What we see with all living organisms is what Vernadsky called the "biogenic migration" of atoms—the transfer of inert material and energy into a living body, where it is transformed and functions for some period of time, and then is excreted or left behind as a different product. The rate at which this happens within the biosphere is also called the "biogenic flux".

The vast deposits of minerals on the Earth today, but also the chemical composition of the Earth's atmosphere, its oceans, its soils and surface formation down to a considerable depth, resulted from living processes. As Vernadsky concluded, the biosphere, including its present system of weather and climate, is thus a natural product of the processes of living matter, or the principle of life.

Life Overturns Newton

The long term of upward biological evolution towards more and more complex organisms, as outlined in Vernadsky's work, proves the Newtonian mechanistic entropic Universe to be a complete fraud. In the Leibniz-Clarke correspondence you would have noted that Leibniz, in his very first letter, exposes the fraud later called the First and Second Laws of Thermodynamics **(page 36)**. To refresh your memory, Leibniz says of Newton that "Sir Isaac Newton and his followers have also a very odd opinion concerning the work of God. According to their doctrine, God almighty wants [i.e., needs] to wind up his watch from time to time; otherwise it would cease to move."

Our Earth is tied to the most remote regions of the Cosmos by radiation originating there.

The principle of life, which is the *sufficient reason* governing our biosphere, manifested in the totality of living matter, defies the Second Law of Thermodynamics, that is, the insistence that there must be increasing disorder of the system from a loss of overall energy. Vernadsky himself states this explicitly, in his *Essays on Geochemistry,* in a passage on what he calls "the growth of active geological energy and the complete change of the biosphere", occurring with the development of new species: "Clausius's entropy does not really exist; it is not a fact of being, but a mathematical expression, useful and necessary when it allows the expression of natural phenomena in mathematical language. … The deviation [from the so-called laws of entropy] by such an essential phenomenon as living matter and its influence upon the biosphere shows that life does not stay within the premises for which entropy is stated."

When looking at the vast expanse of biological evolution, what we see is that the total aggregate of "free energy" of living matter in the biosphere—a measure of its power to do work in transforming the environment—has been constantly increasing, starting with a small molecule, chlorophyll. Vernadsky says:

"All living matter can be regarded as a single entity in the mechanism of the biosphere, but only one part of life, green vegetation, the carrier of chlorophyll, makes direct use of solar radiation. Through photosynthesis, chlorophyll makes direct use of solar radiation. Through photosynthesis, chlorophyll produces chemical compounds that, following the death of the organism of which they are a part, are unstable in the biosphere's thermodynamic field.

"The whole living world is connected to this green part of life by a direct and unbreakable link. The matter of animals and plants that do not contain chlorophyll has developed from the chemical compounds produced by green life....

"Animals and fungi accumulate nitrogen-rich substances which, as centres of chemical free energy, become even more powerful agents of change. Their energy is also released through decomposition when, after death, they leave the thermodynamic field in which they are stable [inside their bodies], and enter the thermodynamic field of the biosphere.

"Living matter as a whole—the totality of living organisms—is therefore a unique system, which accumulates chemical free energy in the biosphere by the transformation of solar radiation."

Now we'll look at a presentation of this history of life on our planet, published by LPAC-TV and including more of this discussion by Vernadsky in the *Essays on Geochemistry.*

Chlorophyll and the Infrastructure of Life

This section is excerpted from the narration of a video titled "Chlorophyll and the Infrastructure of Life", issued by LaRouche PAC in September 2010.

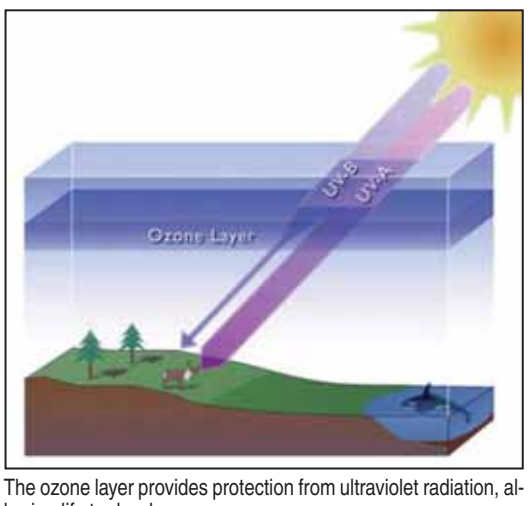
People who say that space is empty are more likely speaking about the inside of their own heads, than about our Universe. Despite what most of us believe about the world we live in, our Earth is not sitting out there in an empty ocean of space. We are, as Vernadsky foretold decades ago, situated in a cosmic medium, a medium filled with cosmic radiation.

When we think about the future of mankind, we come face to face with the problem of cosmic radiation, in the mission to land a man on Mars and colonise space. As things stand right now, we are confronted with the harsh reality that whoever we would send to Mars, would not have the proper simulated Earth gravitational environment in a space capsule, and therefore wouldn't make it to the planet or back home, at least in any form that is recognisably human, because our astronauts would be travelling through cosmic radiation and other phenomena, without the protection of the Earth's electromagnetic field, gravity, and other things in our environment on Earth that keep us alive.

So, one of the primary challenges before us is creating synthetic environments to transport us to other planets, and for developing the habitat of other planets. This mission will force us to think about the immediate challenge of the kind of needed build-up of infrastructure here on Earth, in a much more developed systematic way, as the challenge of creating synthetic environments suitable for our growth and existence is not a local challenge, but a planetary one. *That* is what we must come to understand as infrastructure.

Now, don't make the mistake of thinking that mankind is the only species that looks at things in this way. It's clear from the history of Earth's biosphere, that we have a common friend in the green plant, which, by aid of photosynthesis, has created its own synthetic environment to sustain life. Looking at the development of our oxygen-rich atmosphere may give us some insight into the real nature of infrastructure.

Model of a chloroplast, which is what makes green plants green. Actual size: 5 micrometres long, 2.5 micrometres thick.



The ozone layer provides protection from ultraviolet radiation, allowing life to develop.

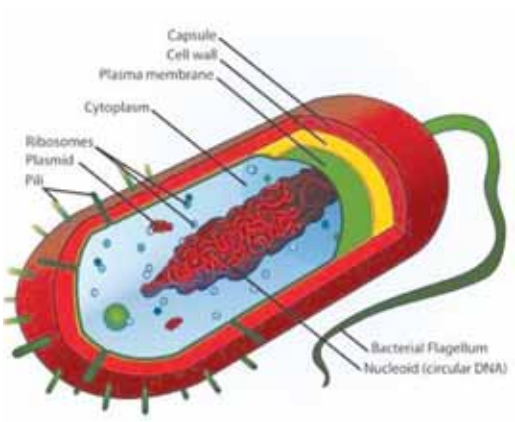
Transformation of the Atmosphere

The atmosphere of the young, primordial Earth would have been very unpleasant for many of the life forms we have today. At one of the earliest periods in the Earth's history, we can recall the atmosphere of Earth consisting mainly of carbon dioxide, methane, ammonia, and water, although other compounds existed. The earliest Earth atmosphere consisted mostly of the mixture of gases that are familiar to us from volcanic activity. Although this created some rough environmental conditions, life emerged and began to develop as soon as it possibly could. The earliest life-forms were single-celled *prokaryotic* organisms that contained everything they needed within that one cell. They had a simple internal structure and got their nutrition directly from their environment.

Soon, in the course of geological time, perhaps even as long ago as 3.5 billion years, organisms developed which were able to obtain their energy directly from the Sun, with the aid of water and carbon dioxide—the phototrophs. These organisms were probably the evolutionary precursors of what we know now as the chloroplast, an organelle found in eukaryotes. This new way of obtaining energy from the Sun produced oxygen gas as its by-product. As the oxygen accumulated in the atmosphere, some of this oxygen was converted to ozone, as a result of the ultraviolet radiation coming from the Sun. This ozone created a protective layer over the crust of the Earth, allowing for the evolution of land creatures and other plant life, giving green plants protection and free rein to flourish and dominate, and create the oxygen-rich atmosphere we breathe and enjoy today, through the process called *photosynthesis*.

Through photosynthesis, green plants transform carbon dioxide and water into free oxygen and carbohydrates. The chlorophyll found in the ocean and in plants is key in this process. It's found in the chloroplasts of green plants and it is what makes green plants, green. In the oceans this occurs through the phytoplankton, tiny single-celled plants that live in the ocean and serve as the base of the oceanic food chain.

In both cases, in plants and in the ocean, the chlorophyll molecule absorbs sunlight, water and carbon dioxide. Luckily for these plants, carbon dioxide is released into the atmosphere by a number of sources, including volcanic eruptions, hot mineral sources, natural gases, and weathering of igneous rocks from solutions of seas and fresh water, to the respiration of plants and animals during their life, and processes related to their decomposition or decay after death. And also, through soils. Carbon dioxide is, quite literally, the life-blood of living processes.



Prokaryotic organisms, the earliest life forms, consisted of a single cell.

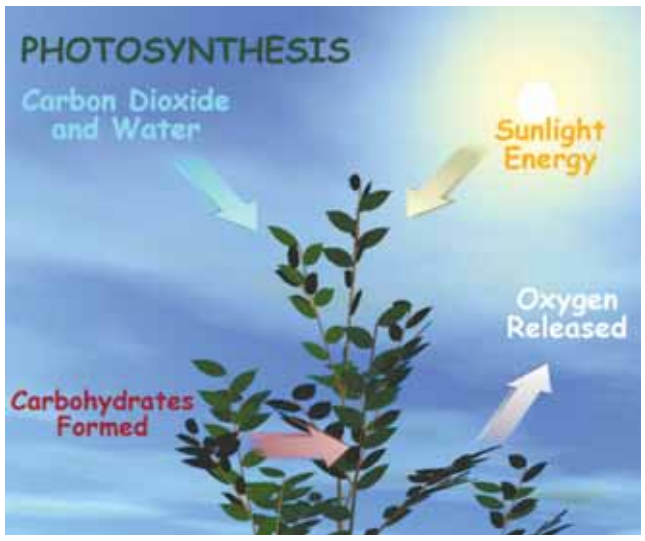
From this abundance of carbon dioxide in the atmosphere and the sunlight absorbed, the chlorophyll chooses the elements it wants for food and energy, turns them into carbohydrates and tasty sugars for its own nourishment and satisfaction, and releases the oxygen from the water as the waste it doesn't need, creating the conditions for the oxygen-rich atmosphere that we have today. This process has created the environment, the infrastructure for life to exist in increasing numbers. It has become known today as the carbon cycle.

The "Carbon Cycle" Is Not a Cycle

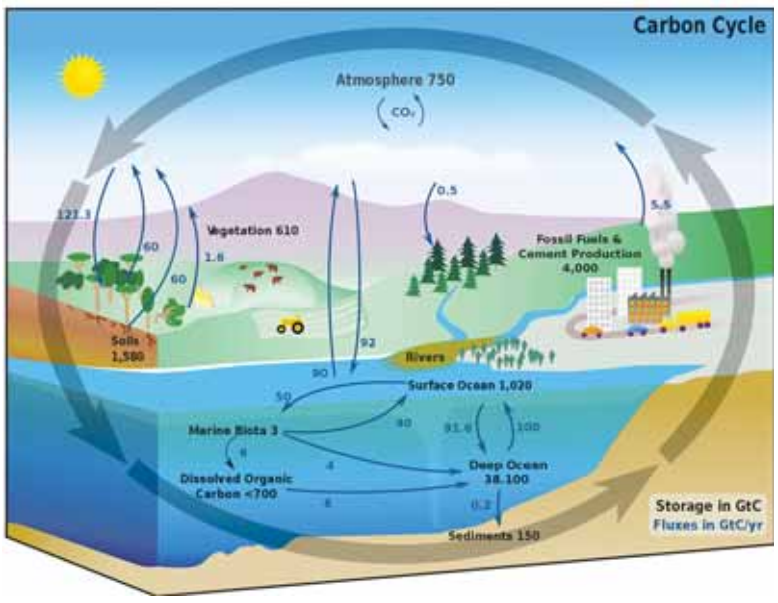
The carbon cycle has not only provided Earth with free oxygen, but has been a primary factor in facilitating the creation of an entire sphere of living activity, the synthetic environment we call the biosphere, through green plants' conversion of cosmic radiation. The biosphere has changed the entire chemical and biological system of the organisation of Earth. It has become a vector according to which non-living materials are transformed. This is what we really mean by *synthetic*. We don't mean *artificial*. We mean materials being brought together, or synthesised, through a fundamental transformation, in order to serve a purpose in life that they would otherwise not serve in the domain of non-life, just like carbon dioxide.

This transformative power expressed by photosynthesis in plants, is expressed in life generally, and in life's ability to incorporate cosmic radiation and non-living materials found in the lithosphere, into functional material for the development and expansion of all life. It expresses the upward evolution of the Earth. Suddenly, we are forced to realise that the idea of a carbon cycle is very misleading, and in fact, it's a fallacy to say that the carbon cycle is merely a cycle at all. And if we are really going to understand the importance of life's role in creating the infrastructure for further life and its effects, we have to re-examine the assumption built into the idea of the monotonous cycle, the Second Law of Thermodynamics. …

In his *Essays On Geochemistry*, Vernadsky showed that photosynthesis in plants is one phenomenon that not only absorbs and uses free energy, but creates it. In this case, the free energy consumed is cosmic radiation—sunlight—and the carbon dioxide that is naturally let out into the atmosphere by volcanoes, natural gases, water vapour and other phenomena. The photosynthesis that occurs in chlorophyll separates the oxygen from those elements, then chooses the carbon dioxide, and combines it with hydrogen from water to create carbohydrates and other compounds for its food, while releasing its waste, the free oxygen, into the atmosphere, an action which cannot even be accomplished through the Sun's solar rays.



Photosynthesis created Earth's oxygen-rich atmosphere out of carbon dioxide and water.



The carbon cycle, diagrammed above, is not a monotonous closed cycle, but expresses the characteristics of the self-developing biosphere.

A New Transformative Power

The chlorophyll acts as a technology of sorts, similar to human technologies like nuclear power plants, which do the work of nuclear fission. The plants use the relatively low-energy-dense solar power as fuel. Think of solar power, along with carbon dioxide and water, as its natural resources. Somehow the chlorophyll is able to accomplish work that solar energy can't, in separating out the oxygen during photosynthesis. It's apparent that a higher form of energy flux density power is applied and, unlike solar power, it has the ability to separate compounds that are bonded in this particular way.

What we end up with is a new transformative power, represented by green plants and life on this planet, with the ability to expand its own activities and transform the activities of the lithosphere through creating a synthetic environment—infrastructure—to push forward its rapid development, expressing an *anti*-entropic effect on the entire planet. What are the effects of this?

Vernadsky says: "Living matter increases the active energy of the Earth's crust in two ways. First, by releasing gases, and, second, as a consequence, creating the terrestrial atmosphere, as its dominant gases such as nitrogen, oxygen and carbon dioxide are biogenic. Due to the fact of these organisms' existence, the quantity of free energy capable of doing work evidently increases towards the end of their life in the surrounding nature, and eventually in the course of geological time.

"The free oxygen produced by green plants, the coal forming from their remains, the organic compounds of their bodies, which nurture animals, and the movements, and chemical and physical manifestations, present new kinds of energy activities that are by no means accompanied by the degradation of the initial solar energy. This energy has passed to form, creating an organism that possesses potential immortality, and which increases and does not decrease the active energy of the initial solar rays. Due to the existence of life, the entropy of the Universe should decrease in biospheric phenomena, and not increase."

(End of LaRouche PAC video excerpt.)

That is, life in the biosphere causes a higher and higher potential state of organisation—there is no Newtonian clock that winds down.

Life, the Most Powerful Geological Force

With this free energy to do work within the biosphere, that is, the overall increase in power, living matter has become the *most powerful geological force.* This is an extremely important idea. The total mass of living matter is far less than the mass of non-living matter in the biosphere: no greater than tenths of a per cent of the biosphere by weight, something like 0.25 per cent of the total. This tiny portion of the whole has a power far exceeding its physical weight. Think ahead to the noösphere: just as the quantitatively smaller living matter within the biosphere governs the non-living matter, we then have in the noösphere the power of human cognition. In that case, you can't even weigh it at all: what is the weight or the mass of a thought? And yet, mind exerts power over both the biosphere and the lithosphere.

The relative size and the relative power of the three phase-spaces is neatly summed up in another video, prepared last month [June] by the Basement for an audience in Ukraine:

"Vernadsky takes Riemann's ideas to an even higher level, establishing a Universe capable of containing within itself the three distinct phase-spaces of the abiotic, the biotic, and the cognitive. With respect to the interaction of these three phase spaces, Vernadsky shows that life is an organising force for the non-living. Despite being a relatively 'weak force', the slow activity of life over millennia has a greater geological effect than any ostensibly abiotic phenomenon. Although a single bacterium would probably lose, in any immediate conflict with a mountain, the bacteria have had the more significant lasting effect upon mountains, than vice versa. In the same way, although a single, unarmed, average human probably wouldn't survive a conflict with a large bear, it is the humans—and not the bears—that have the potential to organise all life on the planet, shaping forests and landscapes, while training bears to ice skate.

"These studies culminate in Lyndon LaRouche's concept of physical economy, the science of how mankind organises the Universe as co-creator. This includes our present work on the history of the development of Earth's biosphere, and its relationship to cosmic processes. Vernadsky understood this development as a process which mankind must revolutionise with its own economic activity, subsuming the biosphere, in all of its cosmic extent, within the noösphere."

A majority of the matter in the biosphere, within the Earth's crust and the oceans, is a product of life, over billions of years of constant interaction between living processes and cosmic radiation—mainly from the Sun. The Earth's crust, its oceans, and the atmosphere are products of the biogenic migration of atoms from the inert part of the biosphere, into living bodies, and then being exhaled or excreted or left as small fossils. For example, the chalk of the White Cliffs

of Dover, or iron ore deposits in the Earth's crust, are non-living now, but are products of life.

This fraction of living matter has always been relatively tiny, throughout geological time, and its directed evolutionary development, creating ever-increasing amounts of free energy, is unique to living organisms. It is not found in the non-living domain, also called the inert domain. This difference creates an *absolute* material-energetic distinction between living and non-living processes.

Throughout the geological history of the Earth, the processes of the non-living or inert matter in the biosphere have remained the same, for billions of years, except when acted upon by living matter. Under the actions of living processes, that is, through the unique property of the multiplication of living matter, the "envelope" of the Earth that is populated by living organisms—the biosphere—has been constantly expanding, extending it upwards into the atmosphere, into the depths of the oceans and ever deeper into the Earth's crust (about three kilometres).

The White Cliffs of Dover (above) and iron ore deposits (right) are products of life.

Life's Colonisation

That process of expansion of the biosphere occurs through the "colonisation" of new regions, formerly not inhabited by living organisms, in the course of which ever more of the non-living matter and energy of the Earth's crust and atmosphere is transformed and caught up into biogeochemical cycles connected with the metabolic and related activity of living organisms—what Vernadsky called the "biogenic flux of matter and energy in the biosphere".

Vernadsky stated that life covers land in an almost uninterrupted film, extending some tens of metres above the surface in forested areas. The physical geography of the land areas can determine the types of life that are possible, but there are no permanently sterile areas anywhere on the surface of the Earth.

When considering water bodies; oceans, lakes, rivers, and underground water, Vernadsky used the term "living concentrations" when referring to living matter within those aqueous bodies, because they are quite distinct biochemically and biologically, and are different in their geological effect. Nonetheless, life in these bodies displays motion, the same as life on land.

In his work *The Biosphere*, Vernadsky sought to quantify certain aspects of the behaviour of living processes. One of these delightful concepts is the "speed of transmission and multiplication of life". He said that extensive films, formed by bacteria, are constantly observed in the biosphere, and there is enormous biogeochemical energy associated with these forms of life. Giving a sense of the power of the biochemical energy involved, and the potential for life to utilise it, he stated: "If the temperature of the universal sea had been favourable, and there had been no obstacles to multiplication, spherical bacteria (each 10^{-12} cubic centimetres in volume [0.000000000001]) would have formed a continuous skin over the Earth's approximately 510,000,000 square kilometres in less than 36 hours."

From the discussion above, we have the idea that upward evolutionary development, leading to a continual increase in the free energy of living processes in the biosphere, is unique to living processes and represents a fundamental material-energetic break with the domain of the non-living.

At the end of the first Part of *The Biosphere*, Vernadsky left a wonderful summary of the principle of life that caused the editors of the 1999 English edition to write extensive footnotes to try and "hose down" what he had laid out, in his non-reductionist method: "The appearance and formation of living matter on our planet is clearly a phenomenon of cosmic character. It is also very clear that living matter becomes manifest without abiogenesis [life coming from non-life]. In other words, living organism has always sprung from living organism during the whole of geological history; they are all genetically connected; and nowhere can solar radiation be converted into chemical energy independent of a prior living organism."

States of Space

What Vernadsky captured in his book *The Biosphere*, which, as I mentioned, came out in Russian in 1926 and in French in 1929, was the detailed record of his research up until that point. The work Vernadsky did over the rest of his life, from what most people consider the "retirement" age of 65 until his death in 1945 at the age of 81, represented his most profound contributions to science. Pursuing his creative breakthroughs under the pressures of the devastating political purges in the Soviet Union of the 1930s and then during World War II, and all the time continuing to provide crucial leadership within the Soviet Academy of Sciences and various urgent national programs, Vernadsky only opened the book, so to speak, on some of the major questions he grappled with, and he died before he could settle a number of the questions he raised.

This period started when he met and worked with Marie Curie in France in 1924.

The key area of Vernadsky's scientific investigation was investigating the structure of real (physical) space and time. These were burning issues for all scientists, in the era of Einstein's breakthroughs and Planck's work, as we have seen. Vernadsky believed that here the key would be found to that question about the qualitative distinction of life, of living matter, which had captured his attention in his studies of geochemistry and the biosphere. When Vernadsky met and worked with Marie Curie, she was able to elaborate for him the nature of Pierre Curie's final, incomplete work.

Vernadsky recorded in an unfinished late work, "She thinks that this notion [of the states of space] contained the synthesis of his [Pierre's] thought." She reported to Vernadsky that Pierre Curie had challenged the reductionist view of empty space, putting forward the idea that there is a real structure to space, which may not be everywhere the same. Throughout the rest of his life, Vernadsky credited the notion of a "state of space" to Pierre Curie.

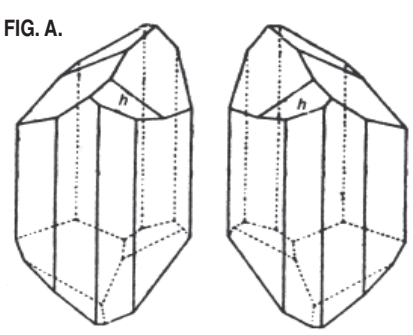
Pierre Curie's Inspiration

In draft lecture fragments from the 1920-27 period, discussing "the principle of symmetry", Vernadsky said about Pierre: "The principle of symmetry has encompassed, and is encompassing, ever more new domains in the 20th century. From the domain of matter, it penetrated into the domain of energy; from the domain of crystallography and solid state physics, it entered the domain of chemistry, the domain of molecular processes, and the physics of the atom. There is no doubt that we shall find its manifestations in the world of the electron, which is even more remote from the complexes surrounding us, and that quantum phenomena will be subordinated to it. Undoubtedly, phenomena of life and the universal Cosmos are encompassed by it.

"More than forty years ago, Pierre Curie, in his unfinished works that were interrupted by his death and by the discovery of radium, was the first to point out that the principle of symmetry is fundamental for all physical phenomena. It is just as necessary for understanding them, as extension is. In other words, it has just the same significance for physical space, as dimension does for geometric space. Symmetry determines the physical state of space.

"I must pause here to emphasize the often forgotten significance of the individual. The untimely death of Curie, at the height of his powers, brought to a halt the work of thought in this area for decades.

"Curie grasped the significance of symmetry in physical phenomena, when people were unaware of a connection between symmetry and the facts of physics. He pointed it out, where others didn't see it. After 1906, the year of Curie's death, there opened up before us an enormous new domain of facts, regulated by symmetry, but there was no mind around which would have pointed out, or even wanted to point out, the general significance of this phenomenon, and would have drawn from those facts the inevitable scientific, and then philosophical, conclusions. It would have been otherwise, had Curie been alive in those years, because the new facts were a brilliant confirmation of his vision… [Ellipsis in original.]



Pierre and Marie Curie (l.) inspired Vernadsky. In the 1920s Madame Curie informed him of her late husband's investigation of states of physical space, which had flowed from Louis Pasteur's (r.) work on left- and right-handedness in crystals **(Fig. A).**

"In the scientific domain, thanks to Curie, it could have been expected and anticipated that the principle of symmetry would enter into the explanation of what was happening."

Symmetry and Chirality

What Pierre Curie had been developing as an idea of fundamentally different "states of space" was directly related to the difference between inert processes and living ones, already discovered by Louis Pasteur in the form of chirality, or "handedness". Following Curie, Vernadsky proposed that the differences between living and inert natural bodies, with respect to their *symmetry* and *chirality,* could happen because the space they occupied was in different "states". Both Pierre Curie and Vernadsky saw this notion of "states of space" as a fundamental principle.

Vernadsky writes: "Symmetry is not an abstract notion that is deductively derived, as scientists often think. It is the result of an empirical generalisation that has been worked out (at first unconsciously) over centuries.... Symmetry characterises the different *states of space* of the natural bodies and the phenomena of our planet."

Therefore, the examination of the different properties of symmetry is an examination of different states of space.

Pasteur already had discovered the *dissymmetry* in the crystals of tartaric acid as the result of the actions of living processes. Noelene [Isherwood] went through this yesterday, but, to recap: In 1848, Louis Pasteur succeeded in separating the left- and right-handed forms of tartaric acid crystals **(Fig A)**. He then dissolved them in water, and examined the two solutions in a polariscope. He found that one solution turned a plane of polarised light to the left, and the other to the right. He then collected the crystals of tartaric acid that remained after the process of fermentation with yeasts. He was able to show that only the left-handed form of the tartaric acid is left from the fermentation process, while a type of tartaric acid with equal quantities of left- and right-handed forms (racemic acid) arises in laboratory synthesis of the compound without the involvement of a living process. Obviously, as there are equal amounts of both forms of tartaric acid in the racemic acid, the plane of polarised light was not shifted.

The left- and right-handed crystals are impossible to differentiate chemically. If you took two solutions of tartaric acid—one with the left-handed form, and the other with the right-handed form—and ran every chemical test imaginable, they would both test the same.

The yeast, a living organism, appeared to have utilised the right-handed form of tartaric acid, leaving only the left-handed form behind. Thus we observe *dissymmetry*, arising from the action of the living yeast. Only one of the two possible forms of these crystals is present.

Laboratory-made tartaric acid, however, which does not involve living matter, has equal quantities of left- and right-handed tartaric crystals, a state of affairs showing the characteristic *symmetry* of inert chemical processes. This *dissymmetry* of organic products is typical of protoplasm, and within all kinds of living matter.

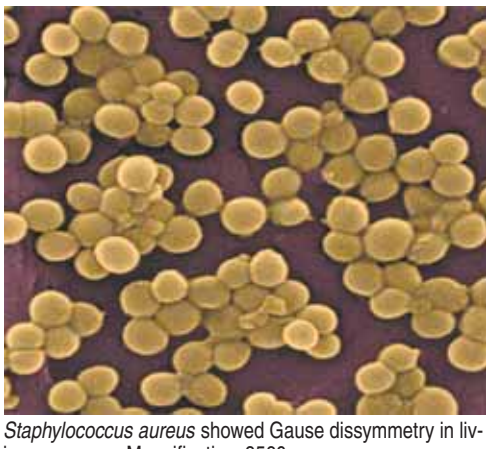
This fundamental property of dissymmetry in living processes was confirmed in the 1930s by a young Russian biologist, Georgii Gause, who was part of Vernadsky's school at that time. Gause survived various political and scientific attacks on his work by making a career move into the military, where his abilities were in demand. Gause, while working with a strain of *Bacillus brevis*, noticed that it inhibited the growth of *Staphylococcus aureus* when the two were in a mixed culture. *Staph. aureus* is a nasty bug that is common in hospital infections.

The *B. brevis* produced a metabolite—a short string of amino acids, which was isolated by Gause, within which he determined that just one of the amino acids (phenylalanine) was not the left-handed form but the right-handed form. Gause named this the antibiotic Gramacidin S, as it had the effect of weakening the cell walls of the *Staph. aureus*, and destroying it. When Gause switched that amino acid back to the other-handed form, it had no effect on the *Staph. aureus.*

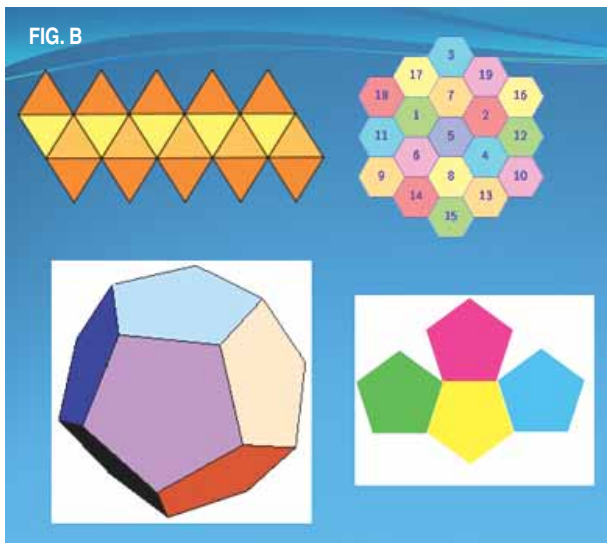
There are many other substances that, when they enter living bodies, exhibit different characteristics, depending on the handedness of the molecules: aspartame is known to us as an artificial sweetener, in one form, but in the other form it is bitter; the chemical compound in caraway seeds gives us one flavour, but the other form gives us spearmint; limonene is the compound that gives lemons and citrus that unique flavour, but the other form gives us a terpenoid, which smells like turpentine. There are various drugs, with which the different handed forms of the same chemical, create useful medicines. *Darvone*, for example, is a an opiate pain-killer, but its other form will cure your cough.

In all living organisms, proteins,

Russian biologist Georgii Gause



Staphylococcus aureus showed Gause dissymmetry in living processes. Magnification: 9560x.



which are large compounds made up of amino acid molecules, only use the left-handed amino acids. Whereas DNA and RNA, the so-called genetic material inside cells, contains only right-handed sugars—especially the right-handed form of the sugar ribose.

It's important to grasp the pattern here: in *non-living* processes the left- and right-handed forms of a given chemical compound behave identically and appear in roughly equal numbers. In *living* processes they differ in their chemical behaviour and effects, and sometimes are found in different proportions, with a great preponderance of one of the forms.

Further exploring questions of *symmetry* and *dissymmetry* as they occur in non-living and living matter, Vernadsky wrote about questions of geometry that go back to the Pythagoreans and Plato. You are familiar with some of them, if you've ever done a pedagogical exercise on constructing the Platonic regular solids. Which regular polyhedra can be constructed? You can investigate which types of faces of those polyhedra, if you lay them flat on a plane, can meet together around a shared vertex point with no gaps, and which ones cannot **(Fig. B)**. Which regular polyhedra can be "close-packed," that is, packed together with no gaps, and which cannot? Take the dodecahedron, the Platonic solid with 12 pentagonal faces. It cannot be close-packed. And, dodecahedral forms do not occur in non-living crystals. But they do appear in the living world. Vernadsky pointed out that in the living world one can see 5-, 7-, 8-, 9- and 12-fold axes of symmetry, such as are not to be found in crystals **(Fig. C)**.

Life's Characteristic Properties

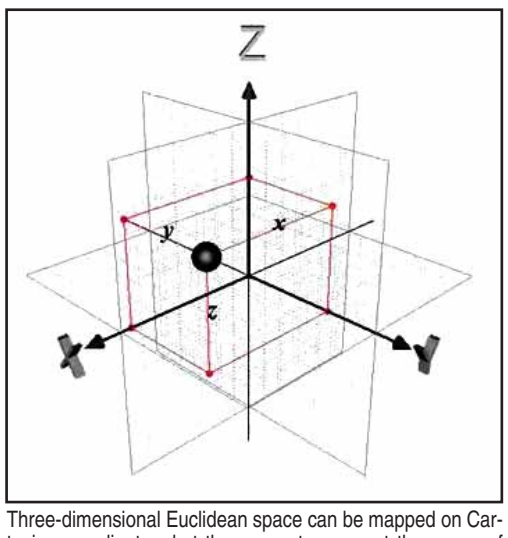
In Vernadsky's crucial 1938 essay, "Problems of Biogeochemistry II: On the Fundamental Material-Energetic Distinction Between Living and Non-Living Natural Bodies of the Biosphere", which appeared in English in *21st Century Science & Technology* in the Winter 2000-2001 issue, you can see a table he drew up, showing other properties that are characteristic of living matter: dispersiveness, stability, and curvilinearity.

Dispersiveness manifests in the sharp separateness of the living organism from its environment. An organism is a body sharply separated from its environment.

Stability refers to the constancy of the form in which a living being exists. For example, birds have always had two wings. They don't all of a sudden grow an extra one. Stable forms of organisms have been observed for hundreds of millions of years. This is not the case with inert structures or processes of inert matter, such as erosion.

Curvilinearity: A living organism is always separated from its environment by curved surfaces **(Fig. D)**. This idea can be amplified by the fact that in mechanical (inert, non-living) structures, curvature is only found in flexible structures as a result of bending. By contrast, living natural bodies "have not been bent into their peculiar curvature, they have grown into it."[1]

Vernadsky proposed that these differences are intrinsic to the space in which these bodies exist. Looking at the identical chemical properties and equal distribution of left-handed and right-handed crystals of non-living matter, Vernadsky wrote: "It follows that the identity of left-handedness and right-handedness is a geometrical property of the three-dimensional Euclidean Space." That is, he said that the symmetry exhibited in non-living matter, wherein both handed forms occur in equal numbers and behave identically, could be accounted for in three-dimensional Euclidean space, through symmetrical constructions using lines and points.



Three-dimensional Euclidean space can be mapped on Cartesian coordinates, but they cannot represent the space of living processes.

With living matter, however, you have something different. Vernadsky concluded: "The absence of this equivalence [of the manifestation of right-handedness and left-handedness], and the pronounced manifestation of left-handedness in the material substrate of living matter and of right-handedness in its functions, indicate that the space occupied by living matter may not correspond to Euclidean geometry".

Vernadsky pursued the question of whether the sharp distinction between the characteristics and the behaviour of living and non-living bodies meant that they occupied different "states of space". He rejected the idea that living bodies could be regarded as existing in Euclidean space. Indeed, in draft essays and public speeches, Vernadsky said the same thing about empty, three-dimensional Euclidean space as he said about Clausius' s "entropy": it doesn't exist!

In his 1931 lecture to the Academy of Sciences, "Problems of Time in Contemporary Science", Vernadsky emphasised: "The space of the geometry of Newton's time inevitably is isotropic [time is the same in all directions] and homogeneous. It corresponds to an absolute void. Such an absolute space, the space of ancient three-dimensional geometry [Euclidean]—empty, homogenous, and isotropic—is not encountered, in reality, by the investigator of nature."

And, from a 1927 written fragment, titled "At the frontier of science. The space of the natural sciences and the space of philosophy and mathematics": "One of the most fundamental distinctions in our thinking—that of naturalists, on the one hand, and of mathematicians, on the other—is the character of space. For the mathematician, unless he specifies differently, space is without structure. It is characterised by dimensions alone. For the naturalist—whether he says so or not, whether he is even aware of it or not—empty, unfilled space does not exist. He always conceives of real space, and deals only with it."

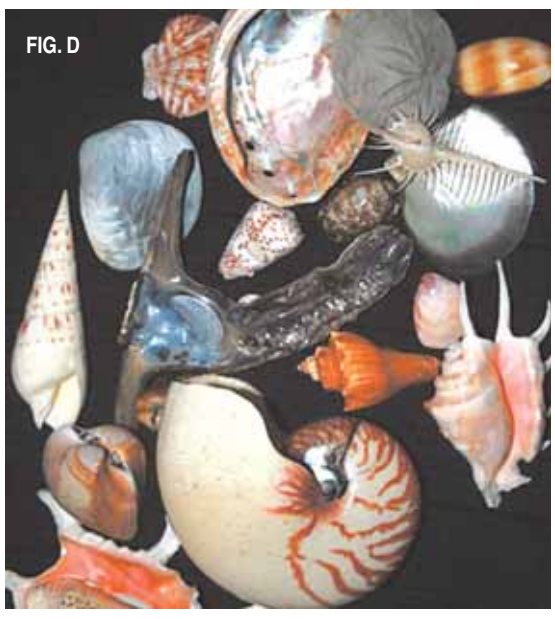
The Space of Living Matter

Vernadsky conducted a survey of mathematician members of the Academy of Sciences, demanding to know: Is there anything you can tell me from geometry, which would account for a space that would allow for the characteristics manifested by living matter? In the 1938 essay "Problems of Biogeochemistry II: On the Fundamental Material-Energetic Distinction Between Living and Non-Living Natural Bodies of the Biosphere", citing his correspondence with the mathematicians N.N. Luzin and S.P. Finikov, Vernadsky included hints about "one of the geometries of the Riemannian type", which might be relevant, and called on geometers to take up this problem. From the final section of that essay:

"[M]athematical thinking grows and discovers its new domains, when scientific thought or the life around us confronts it with new problems. The geometric character of the space occupied by the living matter of the biosphere is such a new problem. Characteristic of that space are polar vectors (i.e., the absence both of a centre of symmetry and of complex symmetry); the non-equivalence of right- and left-handedness…; the marked chemical non-identity of right- and left-handed phenomena and compounds, and of atomic structures (molecules and monocrystals). Characteristic is the conspicuous absence, in living organisms, of plane surfaces and straight lines; the symmetry of living organisms is distinguished by the curved lines and curved surfaces, characteristic of Riemannian geometries. One more identifying mark, which is usual for Riemannian geometries, is a finite and closed space, sharply distinguished from its surroundings, and autonomous. This is completely coherent with the character of aloofness of living organisms in the biosphere, their autarchy."

Vernadsky further developed these ideas in what was to have been an article called "Problems of Biogeochemistry III", which were preserved as manuscript fragments under the title "On the States of Physical Space". There, Vernadsky wrote about the space occupied by living matter: "This space cannot be Euclidian, if only because it lacks the equivalence between right-handedness and left-handedness that is inevitable for Euclidean three-dimensional space. We may try to detect the geometric properties of this space. The following properties of Riemannian space suggest that it will correspond to one or several of the states of this space. Firstly, the fact that an infinite number of Riemannian spaces can exist. Secondly, that any Riemannian space is as if closed, but appears to be unbounded. In three-dimensional Euclidean space, it will appear as a sphere. Thus, it has no straight lines nor plane surfaces, but only curved lines and curved surfaces can exist."

Vernadsky stated what he called the Curie principle, named after Pierre because of the latter's investigation of dissymmetry as a pervasive and fundamental principle. The Curie principle says: *Dissymmetrical effects (phenomena) can be brought about only by a dissymmetrical cause.* This precisely parallels the Redi Principle, named after Francesco Redi (1626-1697), which Vernadsky constantly emphasised, and which states that there is no abiogenesis, that *Life can only come from life.* Vernadsky realised that if space is an intelligible reality, governed everywhere by physical principles and the principle of sufficient reason, then causes and their effects *must reside in the same state of space*, that is, they must be embraced by a *certain state of space* (Curie's term). Not only does the Curie principle echo the Redi principle, but also Vernadsky closely linked together what they apply to, developing the idea that dissymmetry and life were intertwined.



Vernadsky's Time

Vernadsky understood that "space" could not be separated from "time", and that the characteristics of "time" were also different for living and non-living processes.

Vernadsky drew conclusions from his biogeochemical experience, that the processes producing inert natural bodies would show cyclical, reversible, undirected character in the absence of living matter: "The same minerals and rocks have been coming into being since the Cryptozoic [Precambrian, 4.6 billion years ago] until nowadays."

The processes in which living bodies are involved (such as aging, the succession from one generation to the next, and evolution) show, to the contrary, their irreversibility. (Some may wish that these processes could be reversed, but, as we know, that is impossible). Therefore Vernadsky concluded that the processes in which inert natural bodies are involved are *reversible*, and those in which living bodies are involved are *irreversible*.

Irreversibility is also called "a polar vector of time", meaning a vector that has a pole at one end, and only goes in one direction, away from that pole. Living matter exhibits this irreversibility or polar vector of time, in that living organisms die. And evolution, too, is an irreversible process, which takes place only among the living natural bodies of the Earth. So, here you have something entirely different from the statistical survival-of-the-fittest, eugenics-driven formulas of Darwin and his minders; rather, Vernadsky demonstrated the self-development of living processes, the special power of life itself. When you look at Vernadsky's discussion of the irreversibility of the development of living bodies over *time* (you can't really live backwards in time like Merlin the Magician in the King Arthur tales), you see that it is comparable to his discussion of the characteristics of the *space* of living matter: for a moment, think of this irreversibility of time as being like spatial "handedness", but for time.

Inert natural bodies like rocks are characterised by cyclical, reversible processes over billions of years, whereas living processes produce successive generations and proceed in only one direction of time (for example, aging).

Indeed, Vernadsky never looked at space and time separately, but rather he used the term "real space-time" to denote the real time and real space studied by the naturalist, though he remained unsatisfied in his search for their mathematical representation.

Whilst Vernadsky left some of these questions unsettled, there also remains the question of the space-time properties of the noösphere, his third and highest phase space. I will take up this question in our conclusion today, but first I want to shift your attention to the freak-out Vernadsky had caused already with his ideas of the living and non-living phase spaces.

1. D'Arcy Thompson, *On Growth and Form* (Cambridge: Cambridge University Press, 1961).

British Genocidalist Cabal Hated and Feared Vernadsky

From what I have said so far, it is obvious why Vernadsky had been all but excised from the history books, until Lyndon LaRouche recognised his fundamental discoveries, beginning back in the 1940s.

As Ann Lawler presented **(page 19)**, Thomas Huxley's prize pupil, H.G. Wells, already in his 1901 book *Anticipations,* raved in favour of an "ethical reconstruction" of the culture of the entire world, with the intent to establish a "world-state", a one-world British imperial dictatorship. This was to be what Friedrich Nietzsche, the Satanist who was a co-thinker of Wells, termed the "revaluation of all values".

Premised on Malthus and Darwin, that revaluation of values has spawned today's Green Fascist dictatorship over most of the world. The work of Vernadsky threatened to discredit the plot, utterly, in its early years. The founders of Green Fascism feared Vernadsky. They tried giving his work the silent treatment. They tried to divert attention onto their own bogus explanations of life processes. Their agents inside the Soviet Union attacked him directly. And today there are massive, ongoing attempts to coopt Vernadsky into the Green movement by lying about what his ideas were.

A quick look at four people who did more than anyone to create Green Fascism will show how these genocidalists reacted against Vernadsky, and the completely unscientific hokum which they laid down as the foundation of today's environmentalism. The four are:

H.G.Wells himself;

Sir Julian Huxley, Wells's friend, a lifelong promoter of eugenics who was the grandson of Darwin's bulldog;

Max Nicholson, another eugenicist, who was permanent private secretary to the Privy Council and, together with Huxley founded both the British Nature Conservancy and the International Union for Conservation of Nature (IUCN) in 1948, and then the World Wildlife Fund in 1961. Nicholson was the acknowledged High Priest of environmentalism in the post-World War II era. Among his other crimes, he helped set up the Australian Conservation Foundation;

Sir Arthur Tansley, a product of Trinity College Cambridge and the Apostles secret society, personal protégé of Bertrand Russell, and a Fabian socialist who led the establishment of "ecology" as a so-called science, and personally invented the concept of "eco-systems". Darwinism gave birth to the so-called science of ecology, and ecology gave birth to environmentalism.

Tansley: From Psychoanalysis to Ecosystems

Darwin's chief follower and publicist in Germany was Ernst Haeckel, a famous nutcase who invented the term "ecology", based on Darwinism. By the beginning of the 20th century, the British were pushing this new so-called "science of ecology" in earnest. The leader of this push was Sir Arthur Tansley. He founded the British Ecological Society in 1913, the first such organisation in the world.

Tansley's background included three years at Trinity College, Cambridge in the 1890s; informal adoption by the Apostles; and becoming a follower of Bertrand Russell. A friend of Tansley's wrote: "Tansley always said that he owed much more to the contemporary undergraduate society of Trinity than to any other influence at the university, most of all to Bertrand Russell, who had the most penetrating mind with which he came into contact, and who was his favourite companion in midnight talks."[2]

Tansley's father was a Fabian socialist whose occupation was staging big parties for the oligarchy. Father and son both taught at the North London Working Men's College, founded by the Apostles. Tansley specialised in botany at Trinity, and taught there from 1907-22.

In the 1890s Tansley became interested in Sigmund Freud's psychoanalysis, which was brand new. Tansley even psychoanalysed Bertrand Russell—no mean task. The Apostles translated Freud and were his key promoters in Britain.

Freud's whole argument, you probably know, is that inborn instincts determine everything a human being does in life, particularly the so-called sex drive, which is seen as fundamental. Tansley got so excited about psychoanalysis that he quit his post at Trinity in 1922 and went to Vienna to get personally psychoanalysed by Freud, then moved his whole family there in 1923-24. At that time, well over half of Freud's patients in Vienna were from Trinity College. In 1920, Tansley put out a book on Freud called *The New Psychology and Its Relation to Life*.

In that book, Tansley presented the human mind in a typical Freudian way, but with his own special touches. Tansley gave a diagram of the mind *as a combustion chamber in a mechanical engine*, complete with energy flows labelled as "psychic energy". The outside world impinges on this combustion chamber through sense certainty, the psychic energy gets stirred up, and "ka-boom!": it explodes and everything goes out of whack. Tansley, explicitly using the language of the Second Law of Thermodynamics, wrote that the task of psychoanalysis is to maintain equilibrium within the combustion chamber—that is, within the mind.

In a 1922 book *Elements of Plant Biology* about the processes of Nature, including mankind, Tansley spelled this out: "[W]e see varied special cases of *the great universal law of equilibrium*, which governs all the processes of which we have any knowledge, *from the movements of the planets to those of molecules, atoms, and electrons, from the activity of protoplasm to the vagaries of the human mind*." (Emphasis added.) If you think this sounds like Herbert Spencer, you're right. Tansley was a disciple of Spencer, and even wrote a whole chapter for one of Spencer's books.

In his 1932 article "The Temporal Genetic Series as a Means of Approach to Philosophy", Tansley wrote the following about the processes of life, again parroting Spencer: "Its power of arresting entropy is a partial, local and temporary power that is perfectly intelligible physically, and that cannot arrest the process of equalisation in the distribution of energy throughout the Universe at large—a process that will ... ultimately bring about conditions under which the protoplasmic units cannot continue to exist."

It was in a paper published in 1935, "The Use and Abuse of Vegetational Concepts and Terms", which the British imperial thought-police then promoted like crazy, that Tansley proclaimed the existence of *ecosystems*. In typical empiricist fashion, he defined an "ecosystem" from the bottom up, presenting it as a collection of particular things, such as various plants, trees, animals, etc. According to Tansley, the essence of an ecosystem is *abiotic thermodynamic energy flows* among its constituents, beginning with the "energy" of food that is ingested. He wrote in *Elements of Plant Biology*: "All living organisms may be regarded as machines, transforming energy from one form into another, for instance, from the potential energy locked up in the molecules of organic food to the kinetic energy seen in motion of the body…."

Elsewhere, Tansley argued explicitly that these abiotic energy flows produce biotic phenomena, and that biotic phenomena produce the mind. In other words, no phase-spaces such as Vernadsky had already identified. In Tansley's scheme, life is merely a spin-off, an epiphenomenon, of non-life. And the "mind" (but not really the mind, as you can see, rather only the brain)—the brain is merely a spin-off, an epiphenomenon, of living phenomena.

What Tansley laid out there is the guts of what underlies the British hatred of Vernadsky, and what these circles deployed against him—and against humanity. In the case of Wells, Huxley, and some of their key collaborators, we can see how their frenzy was provoked directly *by* Vernadsky. They sprang into action after Vernadsky's 1922-23 lectures at the Sorbonne and the publication of his book in French in 1924.

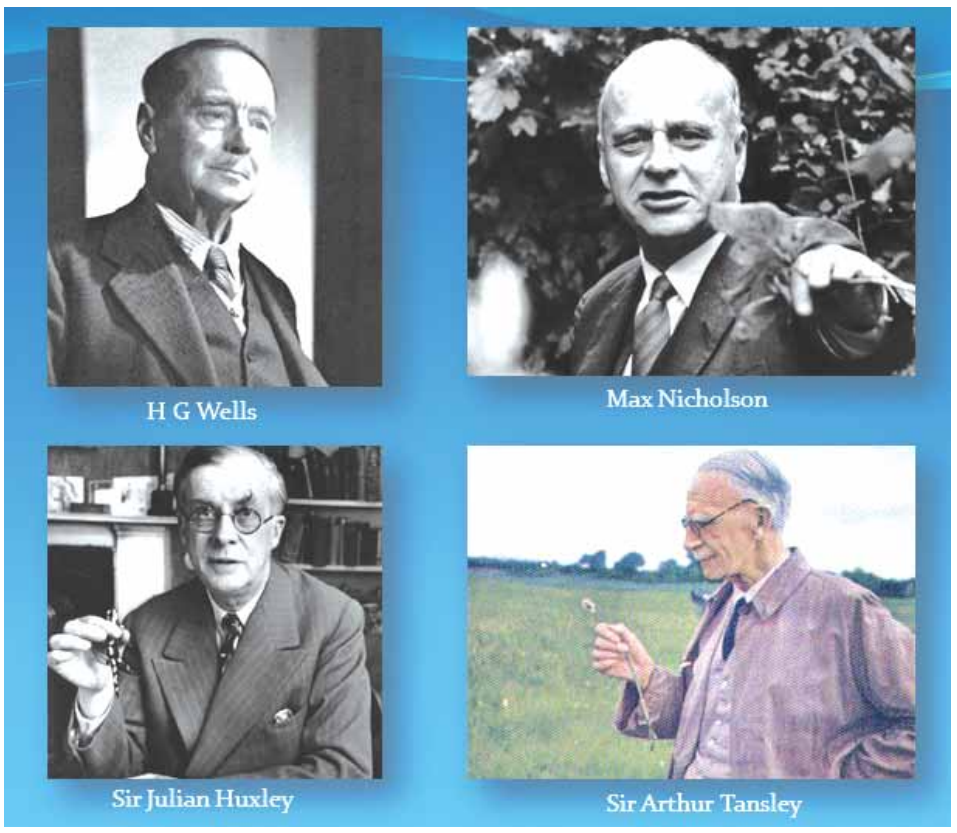
After the Sorbonne Lectures: Le Roy and Chardin

In the audience at the Sorbonne were two friends named Édouard Le Roy and Teilhard de Chardin, a Jesuit priest. Clearly sparked by Vernadsky, these two came up with the term "noösphere", which Chardin, in particular, publicised worldwide, until his death in 1954.

Chardin was a top agent in the cultural warfare operations of British intelligence, including the famous Piltdown Man hoax of 1912. Darwinism was flagging a little bit at that time, because, with a surge in the study of genetics, many people thought that genes determined heredity, the nature of species, etc., rather than Darwin's theory of natural selection.

Along came Chardin on a visit to Britain from France. He went to a quarry at Piltdown, East Sussex, and, together with two guys from the British Museum—which is one of the very top cultural institutions in Britain—and all of a sudden discovered a missing link! A missing link between ape and man, that is. It was dubbed the Piltdown Man, and it gave Darwinism a new lease on life. Some people were suspicious of the new find even at the time, but it was only decades later that the Piltdown man was demonstrated to be a composite of: a human skull from medieval times, a 500-year-old lower jaw of a Sarawak orangutan, and fossilised chimpanzee teeth filed down to simulate worn human teeth.

And Teilhard de Chardin, one of the main fraudsters in the Piltdown Man hoax, got the reputation of being the chief proponent and populariser of the noösphere concept. But Chardin's noösphere, unlike Vernadsky's, ends in the Omega Point, the final equilibrium of mind and matter—just as Herbert Spencer had taught. Chardin was also a promoter of eugenics.



These four ideologues of the British Empire led the way to Green Fascism.

The Anglo-Soviet Attacks

Then there was the Anglo-Soviet facet of British intelligence operations against Vernadsky. In 1924, the year after Vernadsky's Sorbonne lectures, the British biologist J.B.S. Haldane and Soviet biochemist A.I. Oparin each suddenly came out with what was quickly named the Oparin-Haldane thesis, stating that all life evolves from the non-living. Oparin argued that way back in geological time, a combination of basic organic chemicals had formed into microscopic localised systems as precursors of the single cell, from which primitive living things could develop.

Oparin wrote in a 1924 pamphlet: "There is *no fundamental difference between a living organism and lifeless matter*. The complex combination of manifestations and properties, so characteristic of life, must have arisen in the process of the evolution of matter." (Emphasis added.)

Haldane was a top figure in British intelligence. The sudden appearance of this anti-Vernadsky thesis in both Britain and the Soviet Union, simultaneously, is no big surprise, when you know how the British had orchestrated the Russian Revolutions of 1917. Not to mention the fact that the Cambridge Apostles had invented socialism in the first place.

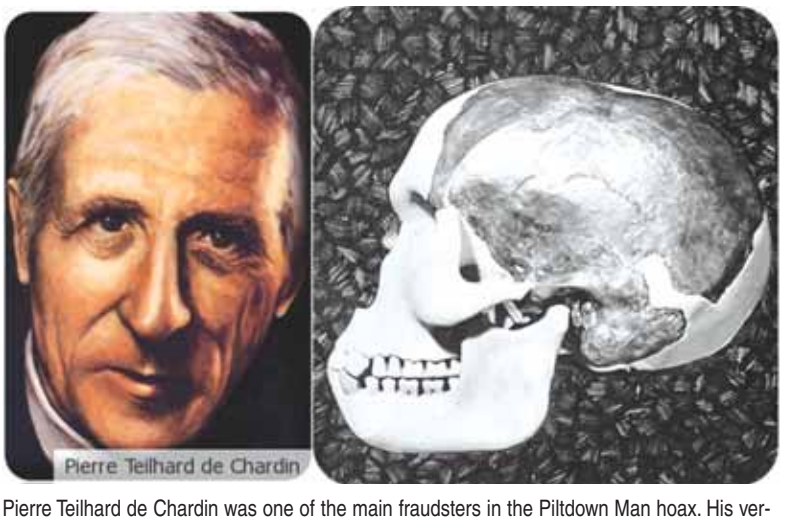
The way history unfolded, the Soviet Union turned out *not* to be the totally controlled puppet that British strategists had intended to create. Lenin and then Stalin, in their own ways, both reflected the deep influence of the American System in Russia. But the British still had many agents in the Soviet Union, and the official state ideology of *dialectical materialism* was a child of British empiricism.

H.G. Wells personally launched another major British operation against Vernadsky, while not daring to utter his name. In 1925, the year after Vernadsky's book on geochemistry had appeared in French, H.G. Wells, Julian Huxley, and Wells's son G.P. Wells of Trinity College, started a crash project to write *the* definitive book on botany, ecology, and life in general. It came out four years later, in 1929, under the title *The Science of Life*.

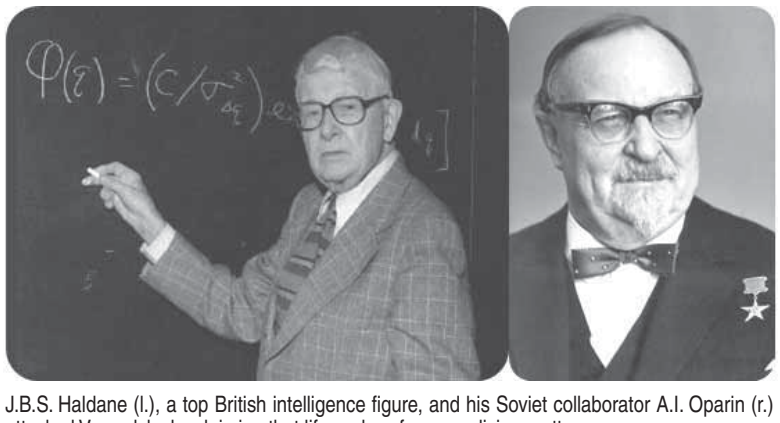
Think about that! H.G. Wells was the best-selling author in the entire world. His *The Outline of History* had sold more copies than any other book besides the Bible and the Koran. Huxley was a famous zoologist, and he quit the best-paying job in zoology in Britain, overnight, in order to devote his full time to this project.

Fortunately, I don't have time to tell you much about the contents of this four-inch thick tome, but it is very nasty. Among other things, the authors claim that Life comes from non-life, and that the mind does not exist, only the brain does. A whole chapter is titled "The Science of Ecology". Its theme is that *human economics is merely a subset of animal ecology*, or *biological economics*, as they put it.

Like Darwin, they insist that Man is nothing but a small piece of nature that is not qualitatively different in the least. When Tansley came out with the *ecosystems* article in 1935, Wells/Huxley/Wells issued a new edition of their book to play up that new hoax.



Pierre Teilhard de Chardin was one of the main fraudsters in the Piltdown Man hoax. His version of the "noösphere" has been promoted in place of Vernadsky's.


J.B.S. Haldane (l.), a top British intelligence figure, and his Soviet collaborator A.I. Oparin (r.) attacked Vernadsky by claiming that life evolves from non-living matter.

2. *Biographical Memoirs of Fellows of the Royal Society*, Vol. 3, Nov. 1957; Arthur George Tansley, "The Temporal Genetic Series As a Means of Approach to Philosophy", prepared (posthumously) by Peder Anker, in *Ecosystems*, 2003: "... [D]uring my undergraduate days I was a close friend of Bertrand Russell, who read philosophy at the same time as mathematics, and it would be difficult to estimate what I owe to the constant intercourse with his singularly acute mind."

The Founders of Modern Environmentalism

H.G. Wells died in 1946. Huxley, Tansley and Max Nicholson went on to set up all of the founding institutions of modern environmentalism: the IUCN, the WWF, and, even more important, the British Nature Conservancy. The Nature Conservancy is the mother of the world's entire Green Fascist movement. It was founded in 1948. Tansley was the first head of the Nature Conservancy, and Nicholson succeeded him. Furthermore, the Nature Conservancy was given royal status as one of four permanent research bodies directly under the Privy Council. Its agenda was world government and mass murder through eugenics.

One of Tansley's earlier articles, from 1939, had already made this very clear. Under the heading "Human Ecology", he wrote:

"In the phase through which humanity is now passing, we see the trend towards internationalism, with world federation as its ultimate goal—the establishment of a world-wide ecosystem—arising inevitably from the increased interdependence of the people, the multiplication of the bonds between them. ... Unless indeed the human race shows itself ultimately incapable of effecting the new adjustments, the necessary next steps towards world-wide integration—and in that case it must relapse into disintegrated barbarism, made all the more horrible by its scientific equipment." [3]

From the start Tansley, like Huxley and Nicholson, raved against alleged world overpopulation. And they didn't just rave, they acted. One of the first "studies" the Nature Conservancy conducted under his leadership, in the early 1950s, was on the effect of DDT on birds. They would put 10,000 times as much DDT onto birds or their eggs as they could ever conceivably get otherwise, and some of the birds died. In 1962, Rachel Carson of the Nature Conservancy's branch in America issued her book *Silent Spring*, based on this research, with the intent to have DDT banned. And it ultimately was. Probably hundreds of millions of human beings have died needlessly due to that ban.

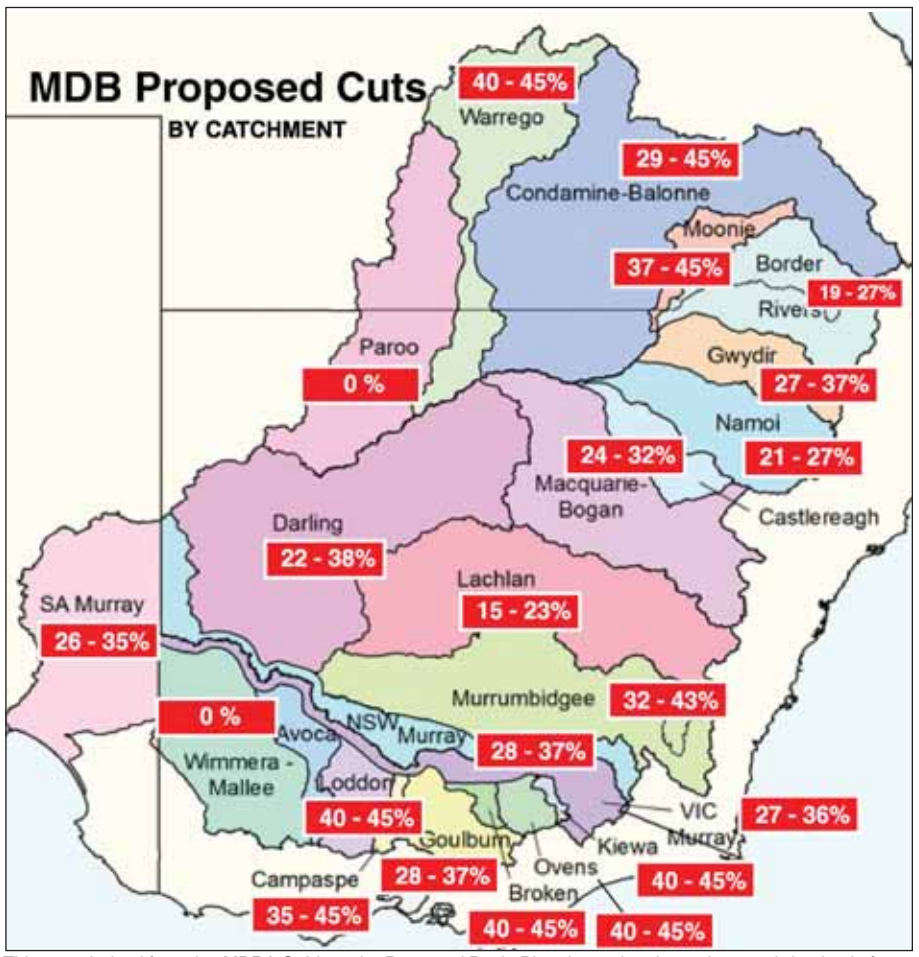
The Nature Conservancy also deployed two of its top agents to Australia, with devastating results. Derrick Ovington helped set up the ACF, and in 1973 became the first head of our National Parks system, which was designed to lock up land, preventing development. Over 12 per cent of our entire country is now affected. The second was Peter Bridgewater, probably *the* key figure in the plot to shut down the Murray-Darling Basin. He was the point man in Australia for RAMSAR, the international wetlands dictatorship set up by Max Nicholson in 1971. Bridgewater had been Chief Scientist for the Nature Conservancy in 1989-90, and then he was sent to Australia to succeed Ovington as head of the National Parks system. What, we couldn't find an Australian?! After heading our Parks System for a decade, Bridgewater became international Secretary General of RAMSAR Convention.

But the plot is to shut down not just Australia, of course, but the entire world.

Today the world's supposed authorities on Vernadsky have come up with a new hoax, intended to bury the real noösphere. They have proclaimed the *Anthropocene Era*. This notion mimics Vernadsky's noösphere: the Anthropocene Era scheme states that man is now the dominant geological force upon the Earth. But, they continue, that is a catastrophe! Promoters of the Anthropocene Era doctrine like Hans Joachim Schellnhuber, whom, as you know, our youth nailed as a genocidalist here in Australia this month, demand that humans shut down essentially all industrial production, or else the whole Earth will die.

It is clear that reviving the true work and outlook of the immortal genius Vladimir Vernadsky is one of our most powerful weapons to defeat Green Fascism.

Privy Council Secretary Max Nicholson, high priest of post-war British environmentalism, preached that "Ducks Unlimited means Sovereignty Superseded".



This map derived from the *MDBA Guide to the Proposed Basin Plan* shows the planned cuts to irrigation in farmland across the Murray-Darling Basin—Australia's food bowl. Prince Philip's ACF demanded more drastic cuts.

LaRouche Continues Vernadsky's Noösphere

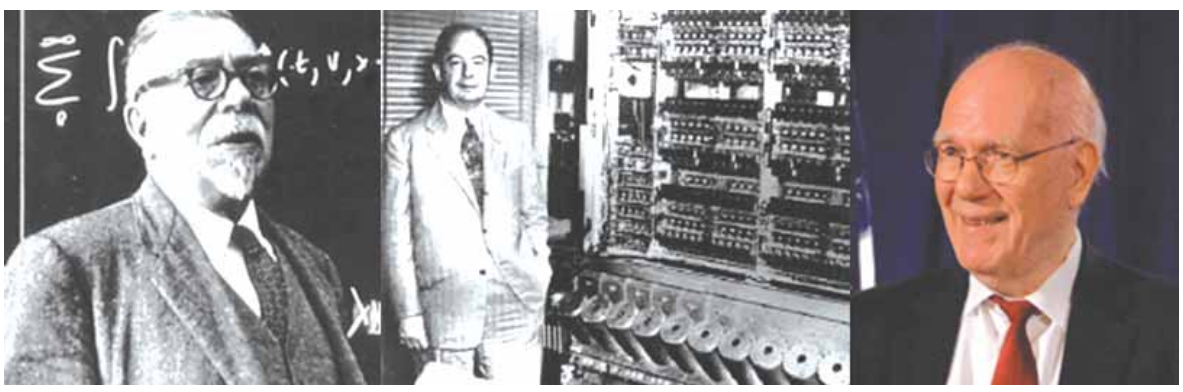
Now that you have a sense of the terror that the British Empire has had, and still has, against Vernadsky's work, I will move to the discussion of the most profound element of that work, which is his concept of the *noösphere*.

Around the time of Vernadsky's death in 1945, a young man in his twenties, Lyndon LaRouche, came to recognise the importance of Vernadsky's work, just in the period when he was refuting the "systems analysis" and "information theory" hoaxes of Bertrand Russell's protégés Norbert Weiner and John von Neumann. Weiner and von Neumann were attempting, in typical Sarpian fashion, to reduce everything in the Universe down to simple arithmetic, statistical and linear modes, with no respect for the principles that Vernadsky or LaRouche had recognised as governing the planet.

Over the last six decades, LaRouche has carried Vernadsky's key conceptions to higher levels than originally specified by Vernadsky, especially the conception of the three phase-spaces—non-living, living and noetic (the noösphere). Furthermore, LaRouche has defined the *principle of physical-economic anti-entropy* as the necessary functional character of the noösphere.

During the many years following his famous lectures in Paris in 1922-23, Vernadsky developed his concept of the noösphere in more and more profound ways, culminating in the optimism that is clearly audible in the 1938 article "On the Fundamental Material-Energetic Distinction between Living and Nonliving Natural Bodies of the Biosphere", quoted earlier. He said:

"We are living in a brand new, bright geological epoch. Man, through his labour—and his conscious relationship to life—is transforming the envelope of the Earth—the geological region of life, the biosphere. Man is shifting it into a new geological state: Through his labour and his consciousness, the biosphere is in a process of transition to the noösphere. Man is creating new biogeochemical processes, which never existed before. The biogeochemical history of the chemical elements—a planetary phenomenon—is drastically changing. Enormous masses of new, free metals and their alloys are being created on Earth, for example, ones which never existed here before, such as aluminium, magnesium, and calcium. Plant and animal life are being changed and disturbed in the most drastic manner. New species and races are being created. The face of the Earth is changing profoundly. The stage of the noösphere is being created. Within the Earth's biosphere, an intense blossoming is in process, the further history of which will be grandiose, it seems to us. In this geological process—which is fundamentally biogeochemical—a single individual unit of living matter, out of the totality of humanity—a great personality, whether a scientist, an inventor, or a statesman—can be of fundamental, decisive, directing importance, and can manifest himself as a *geological force*. This sort of manifestation of individuality in processes of enormous biogeochemical importance, is a new planetary phenomenon. It emerged, and began to manifest itself ever more sharply and profoundly in the course of time, *during the most recent tens of thousands of years*, on the background of billions of years of the prior history of the biosphere, when this phenomenon did not exist." (Emphasis added.)



Lyndon LaRouche (r.) forged his scientific method in the late 1940s by refuting the Sarpian "systems analysis" and "information theory" of Norbert Weiner (l.) and John von Neumann (c.). Simultaneously LaRouche recognised the importance of Vernadsky's work and proceeded to advance it.

Noösphere and Physical Economy

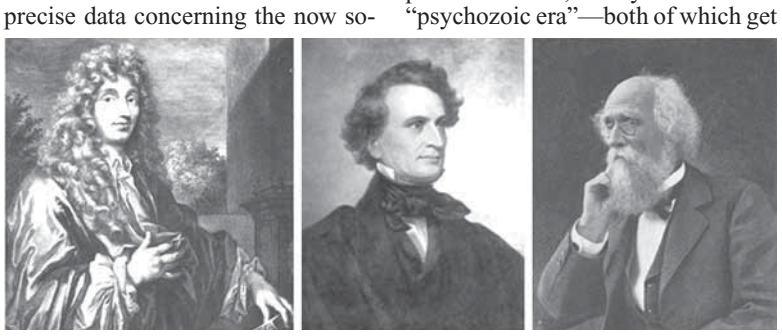
For Vernadsky his concept of the noösphere was not a religious or philosophical idea, but grounded in scientific method. He himself said that it was grounded, above all, in his work on physical economy. Vernadsky's discussion of the physical economy as the noösphere is coherent with LaRouche's idea of Physical Economy as the highest science. In 1994, LaRouche wrote a very important set of essays called "The Science of Physical Economy as the Platonic Epistemological Basis of All Branches of Human Knowledge". Vernadsky's account of the matter is stated right at the outset of one of his last articles, called "Some Words about the noösphere", which was written in 1943 and first published in English in 1945.

"In my own scientific work," he wrote, "the First World War was reflected in a most decisive way. It radically changed my geological conception of the world. It is in the atmosphere of that war that I have approached a conception of nature, at the time forgotten and thus new for myself and for others, a geochemical and biogeochemical conception embracing both nonliving and living nature from the same point of view….

"Twenty-eight years ago, in 1915, a Commission for the Study of the Productive Forces of our country, the so-called KEPS, was formed at the Academy of Sciences. That commission, of which I was elected president, played a noticeable role in the critical period of the First World War. Entirely unexpectedly, in the midst of the war, it became clear to the Academy of Sciences that in Tsarist Russia there were no precise data concerning the now so-called strategic raw materials."

In developing his concept of the noösphere, Vernadsky drew upon many great minds from the past. In this essay, "Some Words About the Noösphere", he presented the "idea of life as a Cosmic phenomenon", and quoted from the 17th-century Dutch scientist and teacher of Leibniz, Christiaan Huygens (1629-1695), who in his posthumously published book *Cosmotheros,* offered the scientific generalisation "life is a cosmic phenomenon, in some way sharply distinct from non-living matter". Vernadsky called this "the Huygens principle".

As part of trying to determine why Man has become a geological force, Vernadsky looked at the work of James Dana (1813-1895) and Joseph Le Conte (1823-1901), who both expounded the view that the "evolution of living matter is proceeding in a definite direction". This phenomenon was called by Dana "cephalisation", referring to the development of more powerful brains, and by Le Conte the "psychozoic era"—both of which get at the same idea.



Precursors of the "noösphere" concept (l. to r.): Christiaan Huygens, James Dana, Joseph Le Conte.

Vernadsky also quoted another Russian scientist, geologist A.P. Pavlov (1854-1929), who had spoken of the "anthropogenic" era, and said that man was becoming "a mighty and ever growing geological force", and "that this geological force was formed imperceptibly over a long period of time".

We can now see where the unique work of Lyndon LaRouche is crucial, because by itself, the concept of "cephalisation" does not adequately explain the process whereby man has become a mighty geological force. Vernadsky, I think, knew this, and from what I understand, he was going to write more on the elaborated concept of the noösphere in the third and final section of the book he was working on when he died, but it remained uncompleted.

Human Thought As a Geological Force

In "Some Words about the Noösphere" Vernadsky posed a riddle. He stated: "The noösphere is a new geological phenomenon on our planet. In it, for the first time man becomes a large-scale geological force. He can, and must, rebuild the province of his life by his work and thought, rebuild it radically in comparison with the past. Wider and wider creative possibilities open before him. It may be that the generation of our grandchildren will approach their blossoming. Here a new riddle has arisen before us. *Thought is not a form of energy*. How then can it

3. "British Ecology During the Past Quarter-Century: The Plant Community and the Ecosystem", *Journal of Ecology*, Vol. 27, No. 2, August 1939.

change material processes?"

Vernadsky, throughout his life's work, scientifically demonstrated the unbridgeable gap between inert and living processes. He demonstrated the two absolutely different space-time characteristics between inert and living matter.

LaRouche has continued to demonstrate (using Vernadsky's own standard of empirical generalisations) that there is another unbridgeable gap between the species nature of us human beings, who reside in Vernadsky's noösphere, and all other living processes. This unbridgeable gap has been empirically demonstrated by the fact that the human species has been able, through deliberate wilful changes and improvements both in individuals and in human society as a whole, to increase our overall population a *thousand-fold* over the course of the time that Man has been on Earth. No other living creature can wilfully increase its overall population, or, to use the scientific term from LaRouche's Physical Economy, its *relative potential population density*, in this way. This is purely a characteristic of mankind.

Man is therefore not an animal conforming to the population and biospheric constraints of other animals. We are a species set apart from all other species by our unique capacity of the wilful use of the creative powers of individual human reason to discover, assimilate and apply new scientific principles to the biosphere. This wilful creative quality makes us *Imago viva Dei*—the living image of God, and able to participate in His Creation.

From the standpoint of physical economy, LaRouche defined the *principle of physical-economic anti-entropy* as the property of the noösphere which explains how Man has become a growing "geological force".

He says in "The Truth About Temporal Eternity": "From the standpoint of physical economy, the validity of a scientific discovery lies in the demonstrable relative validity of the principle of discovery (Platonic higher hypothesis) which governs both the generation, and also the demonstration of that specific hypothesis. The relative validity of that higher hypothesis thus subsuming a generation of particular hypotheses is shown to physical economy by increase of the potential population-density of that society which governs its investment and production policies according to such higher hypothesis, or which, perversely demonstrably fails as a consequence of failing to do so. The validity of a mode of hypothesising the higher hypothesis is measured in terms of the study of human history and pre-history from this same standpoint of the science of physical economy." (*Fidelio,* Summer 1994, Vol. III, No. 2.)

If you reflect back to the Curies' discovery of radioactivity and a whole host of new "radioactive" elements, this was a scientific discovery of a new higher hypothesis. When they started their work, the Curies, like Becquerel, encountered a strange phenomenon within uranium rocks that could not be accounted for within the existing body of knowledge. We can call that "existing body of knowledge" an existing "hypothesis".

Through the processes of scientific investigation, quite often operating on intuition and hints, the Curies discovered "radioactivity", a new physical principle that transformed the previous existing poorer body of knowledge. They "hypothesised", that is "applied the process of discovery" and discovered "a higher hypothesis"—"radioactivity". In other words, there was a major *change* in the way phenomena were looked at, based on the discovery of this new principle of "radioactivity".

As we have witnessed, the development of nuclear power sources has provided a massive increase in the potential free energy available for mankind, and, when it is actually applied, this is *shown in the physical economy in the increase of the potential population density of that society*. Nuclear power gives us several magnitudes greater energy flux densities than coal or petroleum-based fuels, meaning that new, more efficient processes can be developed, above and beyond the existing body of knowledge based on the lower energy flux density forms.

Another simple example is to compare the horse and cart with a modern truck. The process of human creativity has made the necessary discoveries of physical principles, to harness energy to do more work for society as a whole. Tom Lawler Transport would have a great deal of difficulty employing horse and carts in their line of work (I can't imagine a crane mounted in a cart)!

But, the process does not stop at any given discovery of one principle. Human beings can go on "hypothesising the higher hypothesis" all the time, which is the reason that the population of the planet has increased at an exponential rate, and that man has become a geological force. There is a constant process of change from a lower form of technology to a higher, and then a higher, further changed form after that. The process of change here is known as the "invariant of the invariant" or the "hypothesising of the higher hypothesis".

Galactic Environmental Challenges

Mr. LaRouche and his Basement scientific research team have warned starkly over the past several weeks that our planet and the populations on it face a mass extinction threat due to the changing position of our solar system in the plane of our galaxy. We are moving into the upper region, above the plane of our galaxy, which will expose us to more and more cosmic radiations. We have been witnessing over the last year, an increasing frequency of phenomena like earthquakes and tsunamis, and we are at the mercy of a galaxy whose cyclical conditions could wipe us out. As you have heard **(page 18)**, this pattern of extinctions is not new; it has happened several times in the long life of the Earth, just not during the short time that Man has been around. Over 95 per cent of all the living species that ever existed have gone extinct because they were not able to control or modify their environment, or changes in their environment caused by galactic events, like the ones we are facing.

Hydraulic power, an advance over horse power, typifies the results of man's unique creative ability to discover and apply new physical principles.

Human beings, unlike animals, do not have to be hostage to any environment (or limited to a single planet). We have to transform our biosphere to help protect us from galactic extinction events.

Human beings, however, do not have to be hostages to *any* environment.

In order to protect ourselves, right now, we need to employ those powers of scientific discovery which are uniquely ours as human beings created *Imago Dei*, to make the discoveries necessary to harness energy sources such as fusion power and then matter and antimatter reactions. This requires us to search for the physical principles that make these energies possible, just as the Curies did, and with the new technologies we shall develop on the basis of those principles, transform the biosphere even further, and work towards protecting our populations from horrific galactic events.

Mind Is Superior to Sense Perception

But the sticking point today for us is to really understand that, unlike the beasts, we are not, provided we don't listen to Sarpi and company, defined by our pathetic senses, but rather by our God-like creative reason. This quality of reason does not exist in the brain, per se, the physical organ, but rather in the *mind,* for which the brain acts like some form of antenna, resonating with this principle.

As LaRouche said in his paper "At the Brink of Confusion: When Governments Crumble": "Mankind has a mind, or the ability to manifest a mind which is independent of sense-perception. Modern science gives us a very clear picture of that kind of evidence: That what we know, in the discovery of principles, is that the power of the human mind, the so-called creative powers, the powers to create a new state of mind, involve demonstrations of the use of artificial senses, as in the form of our sense-perceptions, as the faculties of our mind. Most people who are ignorant of this, will assume that you can trace what people think, and how they think, to the powers located in sense-perception, or in the so-called animal sense-perception, or the biological sense-perception. That is not true. The human mind is not a product of a mere brain, nor of sense-perception, but is actually a product of what we might call cosmic radiation, a peculiar feature of cosmic radiation, which gives man a special power that no other known living species has."(*Executive Intelligence Review*, 20 May 2011, Vol. 38, No. 20.)

Within Vernadsky's noösphere, man has become a large-scale geological force because of the unique quality of creativity located in the *mind* of Man, which is necessarily in harmony with the processes of the Cosmos in which it exists.

Coming back to Vernadsky's riddle that, "Thought is not a form of energy", it appears that thought, or creative reason, is in fact the most powerful force in the Universe, as we have discussed within LaRouche's work, and is the mover of the "large scale geological force" of Man. Wilful human creative reason, as a reflection of the universal principle of creativity also defines a new space-time geometry for the noösphere, just as non-life and life have their own Euclidean/reversible and Riemannian/irreversible characteristics respectively.

Ask yourself this: What are the characteristics of the space and time in which valid ideas exist? What are the characteristics of the space and time that human beings can exist in, if they do not reduce themselves down to mere animals?

Well, that is the meaning of Raphael's painting of the *School of Athens*, where we started this conference—the realm of ideas and thought!

As demonstrated by the *School of Athens*, ask yourself, "What is the character of the space that the ideas of this person here [in the *School of Athens*] exist in?" In 100 years clock time, would the space within which those ideas represented in the *School of Athens* today, have changed?

The space-time of the noösphere is universal and immortal. Living organisms and inert matter die and erode away. Their physical manifestations disappear and are absorbed into the biosphere.

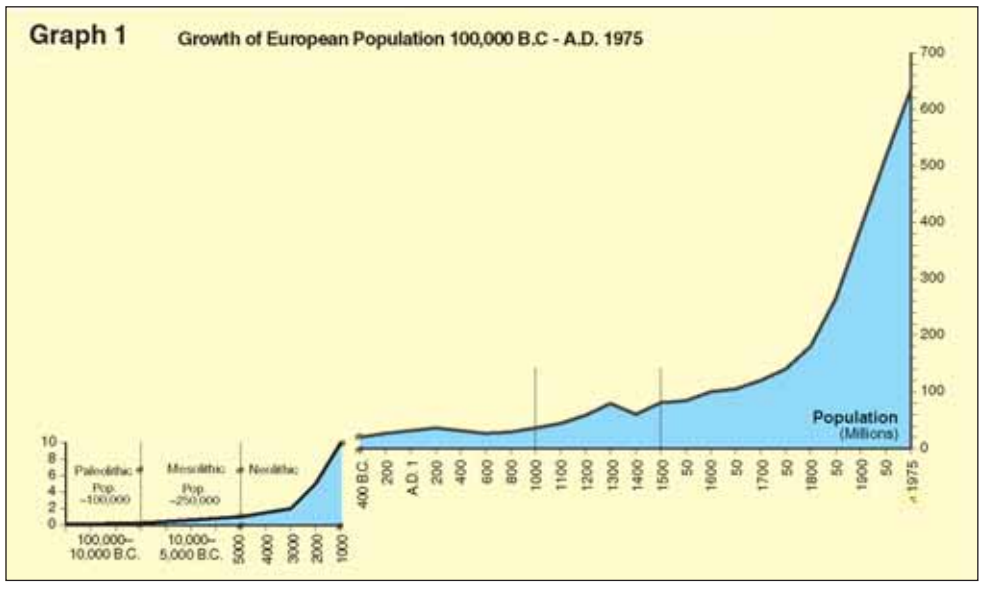
But we remember the name Marie Curie as the discoverer of the principle of radioactivity, so her discovery of this physical principle, and her life, become immortal.

As LaRouche said just Saturday last week, "Only humanity has a sense of a higher purpose, for anything that humanity is going to do, that the individual is going to participate in, and that is the advancement of the human species, to be, in effect, an immortal species. The individual member of the species may die, but the contribution which they contribute, in their role in the Universe, is immortal. And the intention, to an immortal purpose, an end, is the essence of what mankind requires as the motivation, to secure the future of humanity, in a higher form.

"So we go from a lower form, in which the human species is vulnerable, is fit only for extinction under the conditions which are developing now, into a higher form, in which the human species has increased its power in the Universe, as a means of expressing the human role in a higher form in the Universe at large. It's the meaning of human life. Only human life, insofar as we know life, in any part of the world—we may discover a lot of things out there, like that, but we don't know them yet; we have no evidence they exist.

"But we do know about humanity, that humanity has an immortal mission, to develop our skills, our capabilities, so we go from a lower form of life, to a higher form of life, without any necessary other biological transformation. Biological evolution is an irrelevant thing in this matter. It's the increase of man's power."

So, I would like to close this presentation and this conference with those very noble ideas, in *your* minds.



By applying scientific discoveries in the economy, humanity has achieved unparalleled population increases. No animal has demonstrated such a capability.

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