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Vernadsky and His Biosphere

by William Jones

Geochemistry and the Biosphere:

Essays by Vladimir I. Vernadsky

Ed. Frank B. Salisbury

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The publication in English of a new volume of writings, *Essays on Geochemistry and the Biosphere*, by the great Russian-Ukrainian scientist Vladimir Vernadsky, should be viewed with great interest, and not only by those active in the scientific fields with which these essays deal. It is also to be hoped that the publication is a harbinger of more to come in English from the Vernadsky writings.

The work of this towering giant of Russian science has been woefully neglected here in the West, and particularly in the United States. Ironically, much of Vernadsky's work was picked up during the 1970s by representatives of the environmentalist movement, who then tried to draw similarities between Vernadsky with their own particular back-to-nature Gaia philosophy, virtually turning him on his head, and obfuscating both the content and the intent of Vernadsky's life-work.

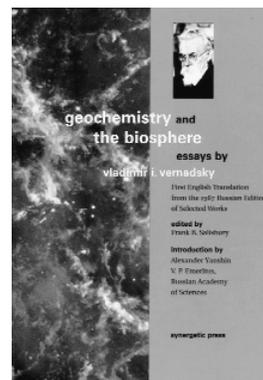
The publication of more of Vernadsky's own writings in English should help to set the record straight on this point. A major step in correcting this distortion of Vernadsky has been the writings of economist and statesman Lyndon LaRouche on the work of Vernadsky, and his introduction of the work of Vernadsky into the LaRouche Youth Movement, which has created recognition of the true significance and import of Vernadsky's work by a much broader segment of the American public than ever before.

The present volume, a translation of a work published in Russian in 1967 under the title *Biosfera*, includes several essays by Vernadsky on the subject of geochemistry, as well as his final editing, in the last decade of his life, of the third edition of his groundbreaking study, *The Biosphere*. This volume gives the reader a good sense of the range of Vernadsky's

thinking in various fields of science.

His chapter on the "History of Geochemistry," depicts how this discipline, with which his name has been most prominently associated, evolved out of the field of chemistry and soil science. The period of Vernadsky's education at St. Petersburg University, 1881-1890, was undoubtedly one of the most fertile periods in the history of that institution, with some of the greatest scientific thinkers of the country located there, including names like Mendeleev, Butlerov, and Dokuchaev, who served as mentors, and as an inspiration to young students like Vernadsky.

The lecture halls were always filled when Mendeleev lectured, Vernadsky relates. "We entered a new and wondrous world during his lectures, as if released from the grip of a powerful vise." Vernadsky also relates how the St. Petersburg department of mineralogy promoted a more dynamic view of chemistry, concentrating not simply on the chemical composition of the Earth's mantle, but also on the dispersion of the chemical ele-



ments, their "migrations," deep into the Earth's crust over geological time.

Here already we see some of the first indications of Vernadsky's own groundbreaking theory of how living matter itself, through such chemical and atomic "migrations," actually forms the outer crust of the Earth's surface. Here Mendeleev also played a key role. "In [Mendeleev's] *Principles of Chemistry*, the problems of geochemistry and space chemistry were not only fully described, but were also often dominant," Vernadsky writes in his historical essay.

The other intellectual influence on the young Vernadsky was Vasilii Vasilievich Dokuchaev, who held the chair in mineralogy at St. Petersburg University, and on behalf of whom he would often undertake expeditions in various parts of



Courtesy of Synergetic Press

Vernadsky (second row, third from right), along with a good part of the faculty at Moscow University, shown here in 1911, when they resigned in protest of repressive measures imposed by the Stolypin government against the Education Ministry.

the Russian Empire. Dokuchaev's *The Russian Black Earth Region*, the result of a seven-years-long labor, also brought Vernadsky a greater understanding of his beloved Ukraine, where he conducted expeditions under Dokuchayev's direction, examining the soil of the region.

Later in the years of the Russian civil war, Vernadsky, who had fled to the family estate in Ukraine, was doing his own studies in the Ukrainian countryside. Already at this early stage, seeing the economic devastation that was caused by the civil war and revolution, he predicted that because of the lack of investment in the agricultural sector, this most fertile region would again be facing a situation of famine.

'Father of the Soviet Nuclear Program'

In the same historical essay, Vernadsky also touches upon the important role of radioactive elements in the Earth's crust, a phenomenon on which he placed great significance. From a trip in the early part of the century, looking in Central Asia for radioactive elements, and later, from the work he would accomplish with the Curies at the Radium Institute in Paris, Vernadsky placed great interest in this "new physics." By 1909, he had established a radiological laboratory in Moscow, and later, in 1922, he set up a Radium Institute, modelled on that of the Curies in Paris. Vernadsky also established the first cyclotron in the Soviet Union at the Radium Institute, on which Igor Kurchatov and other leading figures in the Soviet atomic bomb program would get their initial training.

Early on, Vernadsky realized the tremendous benefit mankind would receive if it achieved mastery of the power of the atom. Like others knowledgeable in the field, he was also aware of its tremendous potentially destructive power. In his opening speech at the Radium Institute, Vernadsky said: "Soon man will have atomic power at his hands. This is a power source which will give him the possibility to build his life as he wishes. Will he be able to use this force for good purposes and not self-destruction?"

During the twenties and thirties he kept well abreast of the field, meeting with Otto Hahn, Lise Meitner, and Arthur Sommerfeld in Germany; Frederick Soddy in Montreal; and the Curies in Paris. It is something of an irony that



Courtesy of Synergetic Press

Vernadsky as a member of the Presidium of the International Geological Congress, in Moscow in 1937.

Vernadsky would first learn of an American atomic bomb program through an interpretation from the *New York Times* in 1943, sent to him by his son, George, who, after the Bolshevik Revolution, emigrated to the United States, where he became a professor in Russian history at Yale University. George had attached a note to the clipping with the message to his father: "Don't be late!"

After receiving this, Vernadsky formed a troika with two of his closest collaborators, to work out a program for the development of atomic energy. This led to the formation of the Uranium Committee, which would later chart the course of the Soviet atomic bomb program. Illness and old age (Vernadsky was then in his eighties), did not permit him a major role in the development of the bomb, but he was often consulted on aspects of the program. His pioneering role in the field really makes him deserving of the title "father of the Soviet nuclear program."

In the essay "Chemical Elements in the Earth's Crust," Vernadsky deals with the actual chemical composition of the planet, utilizing the research conducted in the United States by F.W. Clarke at the Carnegie Institution, which he had visited on a trip to the United States in 1913. Here he is on very familiar ground, studying particular instances of the chemical dispersion of certain elements

from the biosphere into the Earth's outer mantle.

In the essay "Carbon and Living Matter," Vernadsky deals with the study of the hydrocarbons and petroleum deposits. In the context of the alleged "oil crisis" so much bandied about today, the essay of Vernadsky may have more than a passing interest. He holds firmly to the predominant theory that hydrocarbons will only be found as the remains of fossils, that is, they are a result of the decay of living matter, a theory which has been questioned in the work of the late Cornell University astrophysicist Thomas Gold. As Vernadsky himself indicates, Mendeleev, also, thought that there may well be a non-organic origin of oil.

The third edition of *The Biosphere*, published in this volume, may be of some interest to the readers of the earlier edition, published in English. The years of his editing this edition were those in which he was expanding on his early theories, always reconceptualizing and reformulating many of his central hypotheses on Man and the Universe. Some of this is reflected in the changes he made in the last edition of that great work. But those well-versed in the 1926 edition will feel themselves on rather familiar ground in reading this last edition.

Vernadsky's 'Political' Mission

But, it was not only purely theoretical scientific work that Vernadsky was engaged in, in those years. Rather, he saw his scientific work as his major contribution to the progress of humanity. Although more restricted during the Soviet years in his direct political activity, he felt that his work in science and education was his major contribution in the development of the species, of the Noösphere.

Already in his student years, Vernadsky was involved in politics. Some of his closest friends in those liberal circles of his student days, a small group of friends that called themselves "The Brotherhood," would later wind up in a variety of political formations, populist "narodniki," or communists, or followers of the philosophy of Leo Tolstoy. Vernadsky chose another path, devoting himself, as a "cavalier of science" to the natural sciences as a means of promoting the welfare of the people.

During the time of the 1905 Revolution, Vernadsky played an impor-

tant role in the formation of the Constitutional Democrats, (Kadets). When some extremely repressive measures had been imposed on student activity during various phases of that 1905 period, Vernadsky was one of those who went to speak with the Premier, Sergei Witte, in order to help mitigate those measures. In 1911, he, together with a good part of the faculty at Moscow University, resigned in protest of repressive measures imposed by the Stolypin government.

In 1915, during World War I, Vernadsky was involved in setting up the Commission for the Study of the Natural Productive Forces of Russia (KEPS), with the task of investigating the strategic resources and raw materials at Russia's disposal, a project that had been close to the heart of his old teacher Dokuchayev. The significance of this body was recognized by V.I. Lenin, who decided to retain it in the new Soviet Republic.

When the Bolsheviks took power, a disillusioned Vernadsky left Moscow for Ukraine, where the civil war was raging. He spent some time doing research in the countryside, setting up the Ukrainian Academy of Sciences, to which he was elected as head. Later, during World War II, when Vernadsky was evacuated to what is today Kazakhstan, he similarly gathered together the scientific layers there, and set up another Academy.

Both his son and his daughter chose to leave the country rather than stay under the rule of the Bolsheviks. Vernadsky elected to return to the Soviet Union. Not that he had any sympathies with the Bolshevik leadership, but many of his friends were still active in the Russian academic world, some of whom had become communists. More than any other concern which propelled him to make what must have been a difficult decision, was his firm belief in the power of Russian science to revive a beleaguered nation.

Biogeochemistry Is Born

Although he stood in undisputed mastery of his own fields of expertise, in mineralogy and geochemistry, many of his bolder hypotheses and fundamental writings on the nature of the universe went largely unpublished. Vernadsky was accepted as a scientific genius of sorts, but one often attacked and viewed generally by the mandarins of dialectical materialism as an "idealist" and a "vitalist."

In something of a master-stroke,



Courtesy of Synergetic Press

Vernadsky in his office in Moscow, in 1940.

Vernadsky created an entirely new field, biogeochemistry, and established an institute around that study in order to have a forum in which his own notion of the formative role of the biosphere in the chemistry of the planet, also frowned upon by the authorities, might be studied without repercussions.

His most farsighted writings criticizing the prevalent notions of Euclidean space and time in physics, as defective for understanding the phenomena that were being investigated in the biological sciences, and calling instead for the application of a Riemannian, rather than a Euclidean, geometry, went totally beyond the ken of the guardians of "Diamat," and were either suppressed or printed in scholarly journals with a very limited circulation.

In the essays presented here, Vernadsky also outlines the two principal premises on which his life's work was based. The first is the principle of Christiaan Huygens, that life exists throughout the universe and not simply here on Earth, a thesis which Huygens developed most succinctly in his 1698 book, *Cosmotheoros*. His second fundamental premise was based on the thesis of a 16th Century Florentine doctor, Francesco Redi, which said "All life comes from life."

This was an implicit denial of the theory of abiogenesis, as well as sponta-

neous generation. Neither the evolutionists nor the creationists would be happy with Vernadsky. But he simply could find no scientific basis for either of these hypotheses, attributing them both to religious or philosophical principles, rather than to scientific study of the phenomenon of life.

Appended to the *Essays* (as probably they were to the 1967 Russian edition of *Biosfera*), are Vernadsky's short but powerful theses: "Some Words About the Noösphere," published in *21st Century*, Spring 2005, these short notes would be familiar to readers of this magazine, but little has hitherto been said about their origin.

Vernadsky was to have elaborated on his concept of the Noösphere in a third part of his final work, "The Chemical Structure of the Biosphere and Its Surroundings." That chapter was never written. In many respects, the "Some Words" represents his most elaborate view of the topic, although the concept, if not the term, which he borrowed from Edouard LeRoy, permeates most of his work from his student days. But for Vernadsky, "Some Words About the Noösphere" really represented a post-war program for the world.

In 1943, there were celebrations on the 80th birthday of Vernadsky. He

received the Stalin Prize and an award of 200,000 rubles. As was customary, he sent half of the sum back to be used for the war effort. He also penned a note to Stalin: "Dear Joseph Vissarionovich, I request that 100,000 rubles of the prize named for you, which I have received, be directed to defense needs, wherever you see fit. Our cause is just, and at the present time it spontaneously coincides with the onset of the Noösphere—a new state of the domain of life, the Biosphere—the foundation of a historic process, when the human mind becomes an enormous geological planetary force. Academician Vernadsky."

Later that year, when he had completed "Some Words About the Noösphere," he sent his article to two addresses: to the editorial board of *Pravda*, and, to be sure, to Stalin personally.

Here is what he wrote in an accompanying note: "Borovoye, 27 July, 1943. Dear Joseph Vissarionovich, I am sending you the text of my article, which I have simultaneously submitted to the editors of *Pravda*, and which it would be useful to publish in the newspaper, because I identify a spontaneous natural process, which will ensure our fundamental victory in this world war. In the telegram I sent you, donating to the Red Army half of the prize named for you, which I received, I indicate the significance of the Noösphere. With deep respect and devotion. V. Vernadsky. I am sending you the article, because I don't know if it will be published." The article was never published in *Pravda*, nor is Joseph Stalin known to

ever have replied—or received—Vernadsky's note.¹

The 'Book of Life'

The volume before us gives a tantalizing look at the powerful mind of a great scientist, but it leaves one looking for something more substantial, an elaboration of ideas that are only touched upon in these essays. We are encouraged to hear that the same publisher is considering also translating and publishing another book-length study by Vernadsky, *Scientific Thought and Scientific Work as a Geological Force in the Biosphere*.

Having read parts of the Russian edition of Vernadsky's final, and not fully edited work, *The Chemical Structure of the Earth's Biosphere and Its Surroundings*, I have great hope that this book, which Vernadsky himself considered the culmination of his life's work—"the book of life" as he called it—will also soon find the light of day in an English version.

In this work, Vernadsky does not simply expand on an earlier text, as he did with the various versions of *The Biosphere*, but rather approaches the entire issue from a somewhat higher standpoint, from the point of view of the Cosmos as a whole, incorporating all the new ideas that he had developed in the last decades of his most productive life. Vernadsky viewed this final work as his equivalent to the great "Cosmos" that final work of his beloved scientific forebear, Alexander von Humboldt, whose books had impelled the young Vernadsky on a career of science.

While *EIR* and *21st Century Science &*

Technology magazine have published two parts of a three-part project by Vernadsky dealing with the more comprehensive space-time issues provoked by his work in biogeochemistry, the third and final part of that series, "On the Conditions of Physical Space," still remains completely unavailable to non-Russian speakers. It is hoped that the present volume will indeed lead to a resurgence of interest in this remarkable scientist, and to more of his writings in the English language.

While, in this day and age of radar and satellite imaging, many of Vernadsky's "facts" may be somewhat dated (indeed he himself would underline the fact that with the progress of science that *must* be the case), his unique view of man and the universe would be of tremendous benefit to those working in fields about which Vernadsky could have only dreamed—from terraforming Mars to astrobiology.

More important, the fundamental humanist outlook of Vladimir Vernadsky, who viewed the human species and its productive activity as the most important "geological force in the development of the universe," might help revive in society at large, some of the optimism that has been so seriously undermined by the doomsday scenarios of the environmentalist lobby.

Footnotes

1. The text later reports that Vernadsky's article was published in a small Academy journal called *Achievements of Modern Biology*. Vernadsky read the proofs in the Fall of 1944, and lived to see the issue in which it appeared.

Mining the Moon for Helium-3 To Power Fusion Reactors

by Marsha Freeman

Return to the Moon: Exploration, Enterprise, and Energy in the Human Settlement of Space

by Harrison Schmitt
New York: Copernicus Books, 2006
Hardcover, 335 pp., \$25.00

Since President Bush presented his January 2004 initiative for America to return to the Moon, many comments, criticisms, and offers of advice have

been written by the science, engineering, and space communities. But few are as qualified to offer proposals on how this program should be carried out as geologist, Apollo 17 astronaut, former Senator, and professor of engineering, Harrison Schmitt.

When most former astronauts write books, they are usually memoirs of their lives and experiences in space. Harrison



Schmitt has worked, virtually since he was the last man to leave his footprints on the Moon in 1972, on the question of how astronauts will return. His new book lays out his plan.

For nearly 20 years, Dr. Schmitt has