# A.I. Oparin:

150 Years of Vernadsky

# Fraud, Fallacy, or Both?

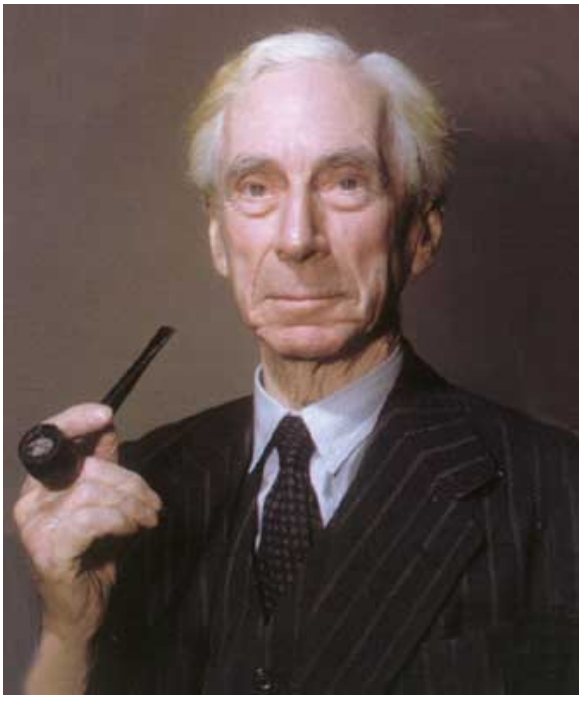
by Meghan Rouillard

The 150th anniversary of V. I. Vernadsky's birth serves as an appropriate occasion to vindicate him and the crucial contributions which he made to modern science, in geology, biology, chemistry, or as he would call it, "biogeochemistry," from the fraudulent and fallacious formulations of a contemporary and conceptual adversary of his, A. I. Oparin. Vladimir Vernadsky and Alexander Oparin, both 20th century Russian scientists, had fundamentally different approaches to biological and evolutionary processes. Vernadsky's conception of the domains of cognition, life, and non-life as clearly distinct, and treated by him as different physical space-times, is in opposition to Oparin's view that all of these processes can be built up from non-living components, and hence, defined solely in terms of those abiotic building blocks. Oparin's view is an example of reductionism which is the much more common approach to the sciences more broadly today than is Vernadsky's unique outlook. Unfortunately, the revolutionary import of Vernadsky's ideas has not been taken advantage of, his ideas supplanted by those of Oparin which have taken center stage. This is apparent in the field of astrobiology, where Oparin is held up on a pedestal as its veritable father.

To a student of Vernadsky, this seems almost as outrageous as it does to a student of Kepler to be told that Newton is the father of the theory of gravitation. Vernadsky's work is highly relevant to this area of study, but to the minds of many scientists (especially Americans), he remains simply forgotten or unknown. The same also applies to the biological sciences more generally, where increasingly, a reductionist approach to the study of living processes is dominant. Vernadsky had a powerful argument indicating that the only way a real breakthrough in the study of life would be made, would be through its treatment as literally representing a unique physical space-time, something that Oparin rejected.

Here we will review the case of Alexander Oparin, and compare his fallacious scientific arguments with respect to the origin of life with Vernadsky's. Many of the profound questions raised by Vernadsky were never dealt with by Oparin, who simply tried to brush them

aside by asserting his own theory. Examining the roots of this fallacy of Oparin, causes it to appear, perhaps more appropriately, as a fraud. His arguments were not original, and they were highly political. The reductionist approach to science in general during the early 20th century was something which was heavily promoted and supported by a highly dubious cast of characters. Realizing this, in addition to exploring the scientific arguments per se, is an important part of understanding what is wrong with Oparin's ideas. Unfortunately, it is an oft-told story in the history of mankind, of being subject to the ideas and policies of empire, through its changing names and locations, which desires to suppress human creativity, and does so using the various means of politics, war, economics, culture, and also, shaping scientific thought. Submitting to this subjugation, while it may save one temporarily from incurring the wrath of that empire, leaves mankind incapable of making the fundamental breakthroughs in science and technology which are needed to progress, in the most rigorous sense of that term, as laid out in the economic writings of Lyndon LaRouche over the past several decades.



*Bertrand Russell sought to make logical positivism, or reductionism, the fundamental scientific method in the 20th century.*

Many, out of ignorance or, perhaps, cowardice, have failed to call attention to these facts. This is a story of not only the political fight which created these circumstances, but the important methodological fight with which it is one and the same. Before getting into the specific fraud and fallacy of A. I. Oparin, and the concepts of Vernadsky, examine the political and scientific landscape of the early 20th century, which was not an easy time for truly revolutionary scientists anywhere in the world.

### A Century Turned Bad

The major breakthroughs made in physical chemistry by such scientists as Dmitri Mendeleev, Max Planck, Albert Einstein and a host of others, as well as prospects for economic development not unrelated to that scientific work, seemed to come to a screeching halt with the turn of the 20th century. The environment shifted politically and scientifically all at once, as leaders such as Otto von Bismarck in Germany, Sergei Witte in Russia, and William McKinley in the United States were overthrown or assassinated. The economic development perspective which they offered, consistent with the intentions of the slain Abraham Lincoln, seemed to disappear with them, and the political mood in Europe shifted into what eventually became the terror of World War I.[1]

The fundamental discoveries made by Planck and Einstein were subverted and made subject to a doctrine of irrationalism, which attempted to interpret the significance of the questions posed by the discovery of the quantum as pointing towards the fact that the laws of the universe were fundamentally, ontologically, not able to be known precisely by man, as Niels Bohr and Werner Heisenberg attempted to argue. The forays by such men as Bohr into outright mysticism not only call into question the intention behind this work, but also point to another Cambridge-educated figure engaged in similar activity at the time, Bertrand Russell, who advocated, on the one hand, for the reign of logical positivism in science, and at the same time, praised any ideology which pointed towards a fundamentally unknowable universe. This is evidenced by Russell's comments on the "implications" of Einstein's theory of relativity in 1925:

> Causation, in the old sense, no longer has a place in theoretical physics... The collapse of the notion of one all-embracing time, in which all events can be dated, must, in the long run, affect our views as to cause and effect, evolution, and many other matters. For instance, the question whether, on the whole, there is progress in the universe, may depend upon our choice of a measuring of time. If we choose one out of a number of equally good clocks, we may find that the universe is progressing as fast as the most optimistic American thinks it is; if we choose another, equally good clock, we may find that the universe is going from bad to worse as fast as the most melancholy Slav

1. This period also marked the death of the last classical composer, Johannes Brahms, and the ushering in of so-called "modern music."

could imagine. This optimism and pessimism are neither true nor false, but depend upon the choice of clocks.[2]

Do not be misled—his comments on relativity, for example, are not made as an impartial scientist, or even a cynical scientist. Lord Russell's comments serve to point us toward the leading oligarchical circles in Great Britain which were determined to introduce fundamental changes into scientific thought at the same time as they intended to fundamentally shape man's self-conception as a way of changing his activity to better suit the purposes of the British Empire.[3]

**Science as Control**

Julian Huxley's 1953 book, *Evolution in Action*, begins with the following assertion: "Science has two functions: control and comprehension."

Most scientists might not make the same formulation as Mr. Huxley, but, then again, Huxley is not rightfully called a "scientist" per se—Huxley, like Russell, actively wrote and lectured on scientific topics at the same time that he played an instrumental role in the world policy-shaping of the British Empire of the time. Huxley was the first director of UNESCO (the United Nations Educational, Scientific and Cultural Organization) as well as a founding member of the World Wildlife Fund, and a leading proponent of eugenics, a perverted application of science for purposes of population control. Huxley was a prominent member of the British Eugenics Society and its president from 1959–1962.

For individuals like Huxley and Russell, a primary definition of science is a means of control.

While Russell focused more explicitly on mathematical physics, Huxley took care of biology and evolution.

Huxley, the recipient of a UNESCO award in 1953 for the "popularisation of science," intended to popularize concepts which were well-suited to the shift in scientific thinking occurring more broadly at the time. This included arguing against the knowability of scientific processes, and accepting and encouraging related cultural ideologies. The conclusions of Huxley and Russell[4] in their scientific writings inevitably converge on the idea that man and his economic activity are harmful, as do the Greens today. They maintain that the destructive (in their view) concept of *purpose* in evolution has led man to believe than he is somehow superior to other species. Their "scientific writings" frequently refer to the need for reducing the human population, as Thomas Malthus had called for earlier, and as Huxley concludes his *Evolution in Action*:

*H.G. Wells, author of* The Open Conspiracy *and* The Science of Life.

> Most educated people now know that the total number of human beings has increased more or less steadily from early prehistoric times to the present, and that each year more people are being added to the population than were added the year before (the present figure is about twenty-two millions). But very few, I believe, realize that the rate of increase itself has been steadily increasing... And there is no sign of its decrease in the near future. The result is that population is pressing increasingly hard on resources; and the further result is that, during the past few centuries, at least, world population as a whole has come to contain vast numbers of

2. Russell himself appeared to prefer the time of the melancholy Slav, having exclaimed after a meeting with Lenin in 1920 that the Russians were unfortunately being turned into pro-industrial Yankees. In early 1920, Russell had tried to discourage Lenin from pursuing an electrification program. Of the Russian people, Russell had once said, "Human beings they undoubtedly were, yet it would have been far easier for me to grow intimate with a dog or cat or a horse than with one of them."

3. See Mike Billington's "The Taoist Perversion of 20th Century Science."

4. From Russell's 1935 *Science and Religion*: "Is there not something a trifle absurd in the spectacle of human beings holding a mirror before themselves, and thinking what they behold so beautiful that a Cosmic Purpose must have been aiming at it all along? Why, in any case, this glorification of Man? How about lions and tigers? They destroy fewer animals or human lives than we do, and they are much more beautiful than we are. How about ants? They manage the Corporate State much better than any fascist..."

undernourished and therefore subnormally developed individuals. Human fertility is now the greatest long-term threat to human standards, spiritual as well as material.[5]

The introduction to Huxley's book features a defense of the Second Law of Thermodynamics, the so-called tendency of processes to become increasingly disorganized. Huxley claimed that the Second Law held for intergalactic space:

> Nowhere in all its vast extent is there any trace of purpose, or even of prospective significance. It is impelled from behind by blind physical forces, a gigantic jazz dance of particles and radiations, in which the only over-all tendency we have so far been able to detect is that summarized in the Second Law of Thermodynamics—the tendency to run down.[6]

*Julian Huxley and his grandfather, Thomas Henry Huxley, "Darwin's bulldog."*

In dealing with life, Huxley found it sufficient for his purposes to emphasize the fundamentally random nature of evolution, and to encourage a fundamentally reductionist approach to the study of living processes.

From Huxley's 1953 book:

> At first sight the biological sector seems full of purpose. Organisms are built as if purposely designed, and work as if in puroposeful pursuit of a conscious aim. But the truth lies in those two words "as if." As the genius Darwin showed, the purpose is only an apparent one.

Huxley also asserted that, "that living substance evolved out of nonliving, is the only hypothesis consistent with scientific continuity," later admitting, however, that the actual process by which such "abiogenesis" occurred "is still conjectural." Huxley tried to minimize the difference between animal and machine by declaring that the only difference lies in the ability of a living organism to construct itself. [7]

The attack on purpose or directionality in evolution, as well as the promotion of a reductionist approach to biology was also laid out in an earlier Huxley project. In 1926, the year before the release in Russian of Vladimir Vernadsky's *The Biosphere*,[8] Julian Huxley teamed up with another infamous family within the British establishment of the time, H. G. Wells, already a best-selling author, and his son, G. P. Wells to write a book called *The Science of Life*. While the elder Wells participated in the writing of *The Science of Life*, he also produced, in 1928, another work that was to become much more world-famous, *The Open Conspiracy*, in which he promoted a fascist world government that would have sole possession of atomic weapons, and be served by an elite with esoteric scientific knowledge.

But there was a clear reason for Wells to join in writing *The Science of Life*. This was not a simple science textbook, just as Bertrand Russell's *ABC of Relativity* was not an innocent textbook intended to make clear the discoveries of Einstein.

*The Science of Life*, completed in 1929, repeated the attacks on purpose in evolution, and introduced the concept of "ecologism" while attacking man's economic activity, going so far as to propose renaming "Homo sapiens" as "*Homo stullus*"—man the fool.

The trio also went out of their way to applaud the work of J. B. S. Haldane, a British geneticist and Darwinian evo-

5. Lyndon LaRouche's economic writings have clearly outlined the fraud of this argument: that human population must be curbed so that a decreasing amount of resources can be more easily shared. With fundamental technological progress, this is unnecessary, a fact obviously known to someone like Huxley. The modern environmentalist movement has attempted to claim Vernadsky as one of their own, something which seems clearly ridiculous after reading Vernadsky's works. For more on this see Ben Deniston, this issue of *21st Century*.

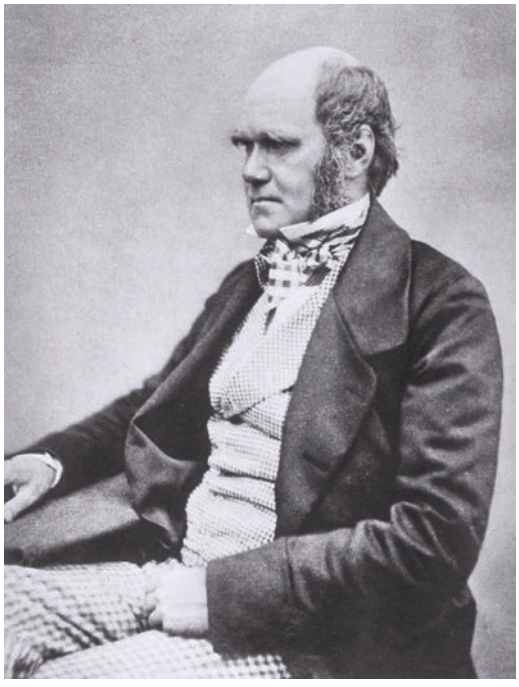
6. In his "The Problem of Time in Contemporary Science," Vladimir Vernadsky had written: "Thirty years later, Rudolph Julius Clausius, then a professor at Zurich, in the principle of entropy, generalized this unidirectional process, which is expressed in space-time by a polar vector of time, to all of reality, as defining the 'end of the world.' In this form, that was an extrapolation of a logical thought, but it is not a phenomenon of reality."

7. Norbert Weiner, the father of "cybernetics," and a student of Bertrand Russell, later made a similar, modified argument with respect to man and machine.

8. Vernadsky had already stunned scientists in the West with the presentation of his ideas in a lecture series on geochemistry delivered at the Paris Sorbonne in 1922-1923.

lutionary biologist. Haldane, a Marxist who later would join the Communist party of Great Britain, had written his own tract in 1929, the same year as the Wells, Huxley, and Wells book, and called it *The Origin of Life*. This was five years after Alexander Oparin's own *Origin of Life* was published in Russian, presenting his totally hypothetical argument for how life could have arisen from non-life out of a "prebiotic soup."

While admitting that it did appear to be the case that all life which exists today has sprung from pre-existing life, Haldane made an identical argument to that of Oparin: that given virtually endless amounts of time, this condition could be proved false, or at least it could be imagined to be proved false. Wells, Huxley, and Wells summarized Haldane's theory in their book:



*Charles Darwin had argued for abiogenesis in the 1870s, about 10 years after the experiments of Pasteur refuting spontaneous generation.*

> But of course, this apparent impossibility of spontaneous generation applies only to the world as we know it today. At some point in the remote past, when the earth was hotter and its air and crust differed, physically and chemically, from their present state, it seems reasonable to believe that life must have originated in a simple form from lifeless matter. It was presumably a fairly gradual change, a slow progressive synthesis, rather than a sudden leaping into being of organisms from formless slime...
>
> Light, even without chlorophyll to act as a transformer, can effect various chemical syntheses. Under the influence of light, small quantities of sugars and other organic substances, some of them nitrogen-containing, are generated from a mixture of such simple substances as water, carbon dioxide, and ammonia...
>
> Such substances are presumably being manufactured today in sea-water, but in much smaller quantities. For it is the ultra-violet waves of light which are active in this chemical transformation, and most of them are stopped in our present day atmosphere by the oxygen in it. In those primeval times, the oxygen-content of the atmosphere was certainly lower, perhaps almost absent, and so the light could get to work to some purpose. But today any of these substances that may be formed are quickly absorbed by the multitudes of living things that everywhere exist, or got rid of by decay... But before there were any living things to absorb them or break them down, they must have accumulated until, as J. B. S. Haldane puts it, "the primeval oceans reached the consistency of hot dilute soup."[9]

photo by Yousuf Karsh

*J.B.S. Haldane wrote his own* Origin of Life*, which featured an argument identical to Oparin's.*

It has always been asserted that the tracts of Haldane and Oparin, possessing exactly the same name, were produced and published "completely independently." Whether or not this is the case, it was clear that at this time, there was an intention coming from those who promoted these ideas to create a broad shift in scientific thinking, especially in Europe, and emphatically in Russia, which was still in post-revolution turmoil, to roll back the breakthroughs in physical chemistry which had been taking place during the last quarter of the 19th and into the new, 20th century.

In 1920, H.G. and G.P. Wells traveled to Russia, with G.P. Wells acting as a translator for his father. There, he took advantage of the opportunity to "exchange ideas" with Russian zoology students.

It has been said that devising a reductionist theory of life itself, rather than simply evolution, was an issue which Darwin personally avoided. But, in fact, he did *not* avoid making the argument himself, and indeed proposed an abiogenic origin of life in almost the exact same manner as Alexander Oparin would later. In a letter to Joseph Dalton Hooker written on February 1, 1871, Darwin suggested that the original spark of life might have begun in a "warm little pond, with all sorts of ammonia and phosphoric salts, lights, heat, electricity, etc. present, so that a protein compound was chemically formed ready to undergo still more complex changes... at the present day such matter would be instantly devoured or absorbed,

9. Wells, H.G., Wells G.P., Huxley, Julian, *The Science of Life*, The Literary Guild, NY, 1929, pp. 438, 651.

which would not have been the case before living creatures were formed."

"Darwin's bulldog," otherwise known as Thomas Henry Huxley, the grandfather of Julian Huxley, had also outlined that very argument years earlier in a lecture he gave on November 8, 1868, called "The Physical Basis of Life." In the lecture, Huxley asserted that vital action is nothing more than "the result of molecular forces of the protoplasm which displays it." The audience was reportedly shocked at the assertion, and the editor of the *Fortnightly Review*, which published the lecture in 1869, said, "No article that had appeared in any periodical for a generation had caused such a sensation."

*Alexander Oparin*

Such has been the nature of the British oligarchy. Viewing science as a means of control, they devise theories which may be shocking at first, but which they intend to make popular. In this sense, popularizing a fundamentally reductionist theory of life killed two birds with one stone. Such a theory could, and would later, be applied to man and beast alike, in an attempt to erase any concept of a fundamental distinction between them. Such a belief, as the British Empire knew very well, could also prove useful in winning a population over to policies such as slavery, colonialism, and free trade, which prevents man from developing economically and living otherwise as the beasts.

The political and scientific fight in Russia during the 20th century, is not a separate matter from these global battles in politics and science of that time.

### The Fraud of Oparin

Soviet Russia of the 1920s found itself divided between two contrary impulses. This was not unlike the situation in Europe, as manifested at the 1927 Solvay conference, birthplace of the "Copenhagen interpretation" of quantum mechanics, which threw causality out the window, and against which Einstein fought tirelessly. During this time, Russia was divided by, on the one hand, an impulse to promote scientific and economic advancement and real, creative scientific work, and on the other, a culture of peasantry and backwardness, supported by Bertrand Russell and his ilk. A handful of creative, independent thinkers were determined to make scientific breakthroughs as they fought against the very difficult circumstances in which they lived. In Russia, this was typified by the personality and activity of V.I. Vernadsky. Vernadsky, who emigrated from Russia to Ukraine in 1917, decided to return to Russia in 1926, to uphold and fight for this tradition.[10] Alexander Oparin represented the contrary view.

The early background of Oparin can be best understood by looking at the role of Kliment A. Timiryazev, one of his earliest inspirations. Timiryazev was known as "Darwin's Russian bulldog," echoing Thomas Huxley's nickname. After the publication of *The Origin of Species,* he was so enthusiastic about Darwin's ideas, that he made a pilgrimage to Darwin's home. Timiryazev was an early Marxist, from the 1860s on, and a plant physiologist at the University of Moscow[11]. Oparin attended Timiryazev's lectures in 1916,[12] which inspired him to enroll there.[13]

Oparin had been a student of Alexei Nicolaevich Bakh, a bio-chemist and member of the Academy of Sciences, at the Karpov Physicochemical Institute, where research was largely focused on identifying the molecular components of life. Oparin and Bakh founded the Bakh Institute of Biochemistry, of which Oparin became the director in 1946. It largely served the function of supporting scientific work which fit well with the ideology of the Soviet regime, such as the work of Trofim Lysenko, whose theory of the inheritance of acquired characteristics represented an extreme and ineffective reaction against the theory of genetics as applied to agriculture. Ultimately, Lysenko was largely discredited, but many were killed for opposing his work.

The extent to which Oparin's own ideological bent dictated his "scientific work" is made clear in the following

10. This is not unlike the case of conductor Wilhelm Furtwängler, who decided to remain in Germany during the Nazi period, to insist upon upholding the classical musical tradition—the best of Germany.

11. This example illustrates how Darwinism began to infiltrate Soviet science, but also politics and culture, through these Marxist circles. Darwinism, "the survival of the fittest," is not merely accidentally analogous to the doctrine of imperialism. It is notable that Friedrich Engels, who spent some of his most important formative years in Great Britain, dominated the Marxist movement and claimed to be its principal "scientific" leader.

12. See Berkowitz, Jacob, *The Stardust Revolution*, Prometheus Books, 2012.

13. The later receipt of Oparin's own lectures was not so stellar, as one student later commented: "Despite his impressive and pretentious appearance (always wearing a bow tie), the lectures were quite dull. It is very difficult to say why, but after the second lecture, students refused to attend them. There was something false in Oparin's manner that students did not like. This refusal created a serious scandal: Such a famous and highly paid scientist found an hour per week to come to the university, but ungrateful students did not want to listen to his lectures!" From Birstein, Vadim, *The Perversion of Knowledge: The True Story of Soviet Science*, Westview Press, 2001, p. 262.

quote from a joint meeting of the Academy Biological Division, Medical Academy, and representatives of the Agricultural Academy. It was initiated by a protege of Oparin's, Olga Lepeshinskaya. The meeting took place in 1950, and Oparin presided over the commission which organized it.

> The attempts to create living systems are possible... only in the Soviet Union. Such attempts are not possible anywhere in capitalist countries because of the ideological position.[14]

From 1927, Bakh headed the VARNITSO (All-Union Association of Workers of Science and Technique to Assist the Socialist Construction) which played a key role in controlling Russian science and the work of the Academy. Oparin later served Bakh as one of its main organizers.[15]

*Oparin working in the laboratory.*

A new Academy Statute of 1929 stated that "a member of the Academy could be deprived his Academic title for acts of sabotage against the USSR." In response to this, Vernadsky wrote in a letter to his son George:

> The Communist party is a world of intrigues and arbitrariness. And on the Party's orders a decent person acts indecently, justified by the Party discipline... Every appointment of a Communist means that a Communist group and a Communist outside organ become extremely influential... A greedy and hungry Communist crowd finds a new way to make a profit: to take positions in science. Secret information on political and ideological disloyalty are sent to the supervisors... and a cleansing process starts... Until now the Academy of Sciences was not touched by this process. Now it comes...[16]

In diary excerpts, Vernadsky referred to the wasteful efforts of Bakh (whom he once referred to simply as an "evil old man") and expressed his discontent at the nomination and appointment of Oparin to the Academy of Sciences in 1939.[17] Vernadsky criticized the project of the Academy to support research of the theory of "abiogenesis," calling it a "wild and ignorant, sometimes crazy" project, promoted by Bakh, and ardently by Oparin.[18]

Oparin personally supported the work of Olga Lepeshinskaya, who attacked the work of her supervisor, Alexander Gurvich, on mitogenetic radiation—a potentially revolutionary theory, largely abandoned as a result of these attacks, but backed by experimental work done by Gurwitsch himself—showing that low-level emissions of UV light are emitted by living cells and possibly aid in directing the growth process of an organism. She also promoted the theory of abiogenesis.

Lepeshinkaya's husband, Panteleimon Lepechinsky, was quoted as saying that his wife knew nothing and should not be listened to: "Don't you listen to her. She's totally ignorant about science and everything she's been saying is a lot of rubbish."[19]

Oparin's own *Origin of Life* appeared not as a book, but as a political pamphlet in 1923, circulating on the streets of Moscow.

Vernadsky, a member of the Academy of Sciences since 1912, did not cower in the face of the scientific tyranny, led by such individuals as Oparin. Perhaps it was the scientific and also economic merit of Vernadsky's own work which spared him the fate of other scientists at the time. For example, Vernadsky had played a leading role in the creation of the Commission for the Study of the Natural Productive Forces of Russia in 1915, known by its acronym KEPS, a body which sought to assess and develop the strategic raw materials of the nation.[20]

Vernadsky's ideas directly challenged the Soviet doctrine of Dialectical Materialism, itself just a breed of reductionism or mechanics. In fact, after 1917, there was a debate on whether Mechanism or Dialectical Materialism would be the official philosophy of the new regime. It was such a tough call, that Josef Stalin had to personally intervene to decide the outcome, in which Dialectical Materi-

14. Ibid., p. 261.

15. Before the Bolsheviks took power, Bakh was known to have been associated with a group called Narodnaya Volya, a terrorist group which assassinated Abraham Lincoln's ally Alexander II in 1881. He then spent 30 years abroad before returning to Russia.

16. Ibid., p. 42.

17. Vernadsky, V.I., Dnevniki (Diaries) 1935-1941. Vol 1. Diary entry on March 29, 1937. p.128. Nauka. Moscow. 2008.

18. Vernadsky, V.I., Dnevniki (Diaries) 1935-1941. Vol 1. Diary entry on March 29, 1937. p.128. Nauka. Moscow. 2008.

19. Birstein, op cit, p. 261.

20. From Bailes, Kendall E., *Science and Russian Culture in an Age of Revolutions*, (Indiana University Press, 1990).

alism won. But Vernadsky also challenged the concepts, of the mother of this doctrine: the British reductionist movement which was actively moving in on the scientific territory of biology and physics. This faction, represented by Russell, Wells, Huxley, et al., explicitly attacked the concept of purpose or progress, especially pertaining to man. Those within the Soviet Union, like Oparin, who were making their career as guardians of the Marxist version of British reductionism, were equally hostile.

Vernadsky explicitly defended and proved the idea of purpose in evolution,[21] a concept attacked outright by the Huxleys and Wellses, in addition to Bertrand Russell. In Russia, his writings and speeches on this idea, such as his "The Problem of Time in Contemporary Science," provoked a significant debate, something which he had intended.[22]

High-level Soviet official and Academician Abram Deborin wrote two attacks on this writing, the second in response to Vernadsky's defense of the idea of time irreversibility, and the fundamental progress invariably manifested by especially living and cognitive processes. Vernadsky's writings on the noösphere were attacked and suppressed at the time, and what has survived of them remains largely twisted to fit the views of environmentalists, clearly not his intention.

It is possible to explore the substance of the methodological fight between Vernadsky and Oparin, which neither discussed much at all publicly, but which is clear from the writings of both, without losing sight of the political nature of the arguments foisted upon science by Oparin, arguments of which his co-thinkers Russell, Wells, and Huxley would be proud.

*Louis Pasteur did experiments refuting abiogenesis beginning in the 1850s and pioneered the study of the unique symmetry of life.*

### The Fallacy of Oparin

The main technical argument of Oparin's *Origin of Life* can be summed up by the following short excerpt from that book:

> The carbon atom in the Sun's atmosphere does not represent organic matter, but the exceptional capacity of this element to form long atomic chains and to unite with other elements, such as hydrogen, oxygen, and nitrogen, is the hidden spring which under proper conditions of existence has furnished the impetus for the formation of organic compounds.

Oparin's thesis ended up being virtually identical to the later thesis of J. B. S. Haldane in Great Britain, summed up by Wells, Huxley, and Wells in their 1929 book, the same year Haldane's piece was published. "The primordial soup," the supposed ancient, hydrogen-rich ocean of Earth, was the ideal location for this supposed formation of organic compounds, with the aid of a little bit of radiation. Oparin described the "evolution" of the Solar System, for the purpose of determining which elements could have been present on Earth and in what state, based on a simple kinematic unfolding.

Oparin acknowledged that the work of his predecessors, most notably Louis Pasteur, did disprove abiogenesis.[23] He reviewed some of the more ridiculous theories of abiogenesis which date back to Aristotle,[24] but said that his own theory added something critical which was not disproved by Pasteur or others. In a sense, he tried to capitalize on a loophole in their experiments which dealt only with relatively short time scales.

Oparin conceded that it was normal to imagine highly organized states as the result of a creative act, be it a factory, or a living thing, and this was overwhelmingly proved to be the case: a factory doesn't appear overnight unless there was an intention to build it. But he then suggested that one could also imagine these things "evolving" from certain random interactions of building-blocks over time. Any product which appears to be the work of a creative act could also be produced by a non-creative process which has millions of years of chances for the building blocks to interact in the right way to produce the more

21. See Vernadsky's "Evolution of Species and Living Matter," in the Spring-Summer 2012 issue of *21st Century*.

22. To appear in the Summer 2013 issue of *21st Century*.

23. Article by Denise and Roger Ham to appear in a future issue of *21st Century*.

24. From chapter 11 of book 3 of Aristotle's *On the Generation of Animals*: "Animals and plants come into being in earth and in liquid because there is water in earth, and air in water, and in all air is vital heat so that in a sense all things are full of soul. Therefore living things form quickly whenever this air and vital heat are enclosed in anything. When they are so enclosed, the corporeal liquids being heated, there arises as it were a frothy bubble." While acknowledging the failure of this kind of early theory, Oparin did cite Aristotle as one of his predecessors.

highly organized structure, he absurdly proposed.

For random interactions of elements, etc. to produce something as highly organized as life would have required a very long time and the right hypothetical building blocks. This is Oparin's conception of evolution as presented in his *Origin of Life*.

Vernadsky's view is altogether different: for him, evolution is not just an expanse of time over which random in-

## Vernadsky's States of Space

Russian-Ukrainian biogeochemist Vladimir Vernadsky used the experimental work of Louis Pasteur to draw the conclusion that the space-time characteristics of life are fundamentally distinct from the space and time of the mathematician or geometer. Such a concept of a malleable space and time is probably best known from the work of Albert Einstein, but Vernadsky's application of such an idea to the field of life is instructive for the investigation of unique physical spacetimes of other processes, even at the cosmic level.

Immanuel Kant wrote on the problem of handedness, and concluded that left and right were fundamentally the same, except only for an arbitrary choice in choosing their names. Outside of that choice in naming, there would be no way to distinguish a priori, with geometry and without referring to other objects of reference, a left from a right hand. However, living processes disagree with the world of Immanuel Kant.

Louis Pasteur showed the unique preference which a living organism has for either the left or right hand, or enantiomer, of a given chemical compound when the compound exists in such a handed form. The rotation of the plane of polarization in polarized light either to the left or right by an organic solution prompted Pasteur to investigate at what level this handedness existed.

For the organic compounds, it could not have been at the level of the larger crystal structure, since quartz crystals (a non-organic compound) will rotate the plane of polarization in their crystal form, but will not do so when dissolved, whereas the organic compounds do rotate the polarization in their *dissolved* form. This led Pasteur to hypothesize a unique molecular asymmetry of living matter, such as the right-handed character of naturally occurring tartaric acid. It is now known that with few exceptions, sugars used by living organisms are right-handed and amino acids are left-handed.

Any variation has shown the opposite handedness to have a completely different physiological effect, such as the case of rare left-handed sugars (the ratio of right to left-handed glucose is at least $10^{15}$ to 1!) and right-handed amino acids.

There are also notable cases of medications which show the effect of a change in handedness, such as dextromethorphan (Robotussin), the well-known cough suppressant, whose mirror-image levomethorphan, an opiate painkiller, will have no effect on your cough. The separation of racemic mixtures is a difficult but often necessary process for this reason, done either with the use of enzymes, or using modern variations of the technique originally used by Pasteur, a mechanical separating of handed crystals.

The sense of smell also registers the difference between two enantiomers, caraway and spearmint being two among many examples, chemically identical except for their effect on our noses.

Pierre Curie, partly informed and prompted by the work of Pasteur, made discoveries in physics, such as the pizoelectric effect, based on recognizing the ontological significance of symmetry.

However, Kant's original question remains: If, in Euclidean space, it is impossible to privilege left over right, what metric do organisms use to make such a radical distinction? If this a priori distinction does not in fact exist in Euclidean space, might it exist for some other geometry?

This problem coincides with yet another, which might at first seem distinct. Just as Euclidean space is incapable of distinguishing a priori between left and right, simple linear time is incapable of distinguishing between progress and regress. Life, however, seems to encounter no such problem in making this distinction. Space and time measurements, as we now know well from Einstein, are also fundamentally linked to one another. If the space of life has fundamentally unique properties, the temporal characteristics should also require the same.

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teractions occur. Rather, his study of the history of evolution showed him that there appears to be a kind of intention causing specific kinds of changes to occur as they do. For example, the biogenic migration of atoms increases throughout evolutionary history, and Vernadsky insisted that a randomly created species could not exist unless it kept up with the requirements of the new system, such as an increased rate of biogenic migration, a requirement, always fulfilled, and not determined by or dependent on random interactions.[25]

Oparin bent over backwards in his 1924 book, *The Origin of Life*, to attack creative intention, even specifically human creative intention. But to discard human creativity and life, and their distinct "fossils," Oparin employed a kind of lazy reason, suggesting that a factor of an exceedingly long amount of time, which he calls "evolution," could somehow give comparable results. Oparin did not, because he could not, actually prove anything—he simply used the "power of suggestion."

It is notable that Oparin felt the need to bring the products of human activity into his arguments about life, as something which should, by analogy, also be subject to reductionism:

> If the reader were asked to consider the probability that in the midst of inorganic matter a large factory with smoke stacks, pipes, boilers, machines, ventilators, etc. suddenly sprang into existence by some natural process, let us say a volcanic eruption, this would be taken at best for a silly joke. Yet even the simplest microorganism has a more complex structure than any factory, and therefore its fortuitous creation is very much less probable...
>
> All these difficulties, however, disappear, if we take the standpoint that the simplest living organisms originated gradually by a long evolutionary process of organic substance and that they represent merely definite mileposts along the general historic road of evolution of matter.

Here, Oparin acknowledged that he still cannot create such a "preconceived plan" as a factory by this means, and admitted that the same challenge exists for something as complex as protoplasmic structure. In both of these cases we seem to have something which "fulfills definite and foreseen aims". But he then counterposed this notion of intention to his idea of evolution—the higher-order processes which are produced are not generative, but "become superimposed" after they come into existence:

> It is inconceivable that such a preconceived plan of protoplasmic structure could exist unless one assumes a creative divine will and plan of creation. But a definite protoplasmic organization and fitness of its inner structure to carry out definite functions could easily be formed in the course of evolution of organic matter just as highly organized animals and plants have come from the simplest things by a process of evolution. Later we shall attempt to trace this evolution and to picture the gradual formation of living things from non-living matter. In this evolution more and more complex phenomena of a higher order became superimposed upon the simplest physical and chemical processes...

In a paper written in 1938,[26] Vernadsky, without explicitly attacking the work of Oparin, laid out a much more rigorous argument, in the form of a table, outlining the fundamental material-energetic distinctions of living and inert natural bodies.

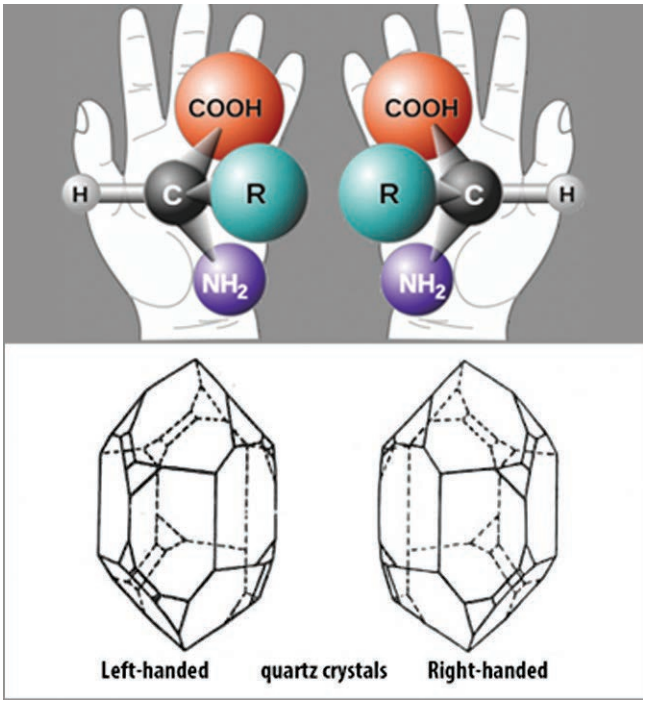
In direct opposition to the assertions of Oparin, Vernadsky wrote:

> The artificial synthesis of a living natural body has never been accomplished. This indicates that some fundamental condition, required for such a synthesis, is absent in the laboratory. L. Pasteur identifies dissymmetry—a special state of space—as the missing condition.

Pasteur himself tried and failed to generate the dissymmetry of living matter using physical forces, such as magnetic fields and a heliostat, for example. He had discovered that there was a special symmetry present in solutions of organic origin which did not only exist at the crystalline level. Louis Pasteur had isolated handed tartaric acid crystals from wine; left and right handed inorganic quartz crystals were also known to exist. The difference was that when the crystalline structure of both of these kinds of crystals was dissolved, that is, when a solution was made, the tartaric acid solution still displayed some evidence of handedness—being able to rotate polarized light to the left or right depending on its overall compositioon. While the quartz crystals were handed, when dissolved in a solution, any trace of this handedness disappeared; the solution could not rotate plane polarized light as the organic solution could. Pasteur himself never asserted at what level this symmetry existed, but insisted that it indicated something fundamentally distinct about living matter. Pierre Curie and Vernadsky both took their cue from the work of Pas-

25. From Vernadsky's 1925 speech, "The Evolution of Species and Living Matter," in the Spring-Summer 2012 issue of *21st Century* and referenced in an accompanying article in this issue: "...a species which was accidentally created would, however, not have been able to survive...only the species which were sufficiently stable, and susceptible of augmenting the biogenic migration of the biosphere, would have survived." See article by Ben Deniston.

26. See Vernadsky's "Problems of Biogeochemistry II" in the Winter 2000-2001 issue of *21st Century*.




*Top: Generic structure of an amino acid. The left-handed form is predominant in life. Bottom: Left and right quartz crystals.*

teur, concurring that the dissymmetry of living matter and its products, compared to the symmetry of non-living matter, was of fundamental significance. Vernadsky tasked mathematicians and experimentalists to work to find a geometry which exhibits some of these characteristics of life, which standard Euclidean geometry is incapable of doing.

Just as Vernadsky thought that the space of living matter had a chiral quality, so should its time—Einstein had shown that these two are intrinsically linked. For Vernadsky, this is expressed in an increase of free-energy, biogenic migration, and cephalization—a general phenomenon of time irreversibility which can be measured on evolutionary time-scales.

Vernadsky comments that the Redi Principle, "all life comes from life," could be reformulated as the Curie Principle—that the dissymmetry of an effect must be present in its cause. Hence, if the unique dissymmetry of living matter could only be generated in the presence of life, life possibly existed for eternity.

Vernadsky's assertion that "there are no special biogenic chemical elements," was in direct opposition to Oparin's definition of life, which asserts that life exists merely due to the presence of three types of chemical bonds among four specific elements, carbon being the most fundamental building block of life. Vernadsky virtually dismissed this as a fundamental criterion. In fact, it is Oparin's view which has become the driving force of astrobiological research—a search for life premised on the search for the right kinds of molecular constellations, disregarding some of the other clues posed by Vernadsky's work.

Vernadsky also refers to the unique isotope fractionation found in living matter—for example, the unique ratio of Carbon-12 to Carbon-13 which is a by-product of photosynthesis. While some kinds of isotope fractionation have "physical" explanations, there remains a whole category which do not, called mass-independent isotope fractionation.[27]

Ironically, though more significance is usually given to the unique handedness of life, it appears that Oparin saw Vernadsky's hypothesis regarding isotope fractionation in life, having a greater significance than a simple physics problem, as a bigger thorn in the side of his theory. In a work assembled by him, based on the Symposium on the Origin of Life on Earth which he organized in 1957, Oparin discusses Vernadsky in the chapter called, "The Eternity of Life."

Here, we have perhaps the most direct attack by Oparin on Vernadsky, twelve years after the latter's death. Oparin correctly characterized Vernadsky's argument with respect to his own: "...our lack of success in bringing about the synthesis of a living thing is due to the fact that the special asymmetric spatial conditions required for the purpose are absent from our laboratories." He also correctly said that Vernadsky placed tremendous importance upon the work of Pasteur, but included as his only evidence that Vernadsky "gave up on this" the fact that in 1944 Vernadsky wrote a paper which did not mention the distinction between right and left, but rather focused on the unique isotopic composition of living matter. Oparin offers no explanation of his own as to why there is a distinction between left and right handedness in living processes. Here, Oparin did give the reader a little insight into how this isotope problem bothered him, acknowledging the problem of needing to explain the origination of this biological isotope fractionation:

> As early as 1926 Vernadsky demonstrated that the isotopic composition of the elements present in living organisms differs considerably from that of the elements derived from rocks and minerals... The direct transition from materials which have not arisen biogenically to living things would seem to be excluded on account of the profound differences in isotopic composition.[28]

27. See Rouillard, Meghan, "Isotopes and Life: Considerations for Space Colonization," in the Summer 2010 issue of *21st Century*.

28. Oparin, A.I., *The Origin of Life on Earth*, Academy Press, 1957, p. 49.

Oparin's only defense ended up being an outright twisting of Vernadsky's own words, claiming that Vernadsky had once admitted that processes at high temperatures and pressures could display unique isotopic fractionation, virtually asserting that this proves that Vernadsky ultimately gave up on the idea of a fundamental distinction between living and non-living matter.

Vernadsky *did* admit this in his 1938 table—under characteristics of inert natural bodies which are distinct from living. Living processes generally have a unique isotopic fractionation. Vernadsky acknowledges that in non-living processes, there can be isotope fractionation (not of the same type or amount as occurs in life), but a varying of standard ratios at high temperatures and pressures, but it is clear that that cause is different than what causes fractionation in life. The unique isotopic composition of living matter does not occur due to high pressures and temperatures, and it is unique in terms of the kind of fractionation it produces. Oparin claims that if life and non-life, even if in totally different circumstances and to different degrees, can cause variation from the standard isotopic ratio at all, fractionation should not be considered something unique to life. Typical of Oparin's reasoning, he insisted that since high temperatures and pressures existed at the time of his hypothetical non-living earth, he could dismiss Vernadsky's insistence on the fundamental distinction of living and non-living matter. But Vernadsky never said fractionation per se was only something life could do. He noted that it occurred in a unique way, and much more generally than in non-life—that in life, it is "characteristic:"

Esther M. Zimmer Lederberg Memorial Website

*Oparin lecturing at NASA Ames in 1969.*

Regarding isotope fractionation in non-life, Vernadsky says:

> With the exception of radioactive decay, isotopic composition (for the terrestrial chemical elements) does not change in inert natural bodies of the biosphere.
>
> Evidently, there exist natural processes outside the limits of the biosphere—for example, the movement of gases under high pressures and at high temperature in the Earth's crust—which can shift the isotopic ratios.
>
> These shifts do not violate the basic constancy, in first approximation, of atomic weights, since those meteorites (galactic matter) which have been studied give the same atomic weights, with accuracy to the second decimal place.
>
> One of the most important tasks of geochemistry at the moment is to obtain a more precise definition of the atomic weight of chemical elements in inert bodies, than is possible through chemistry.

Note that Vernadsky makes the explicit distinction that isotopic fractionation is characteristic of living matter: Evidently, a shift (within certain ranges) in the isotopic composition (atomic weights) inside living organisms is a characteristic property of living matter. This has been proven for hydrogen, carbon, and potassium, and is probable for oxygen and nitrogen. This phenomenon calls for precise investigation.

It is becoming more than probable, that a chemical element, upon entering a living organism, changes its isotopic composition.

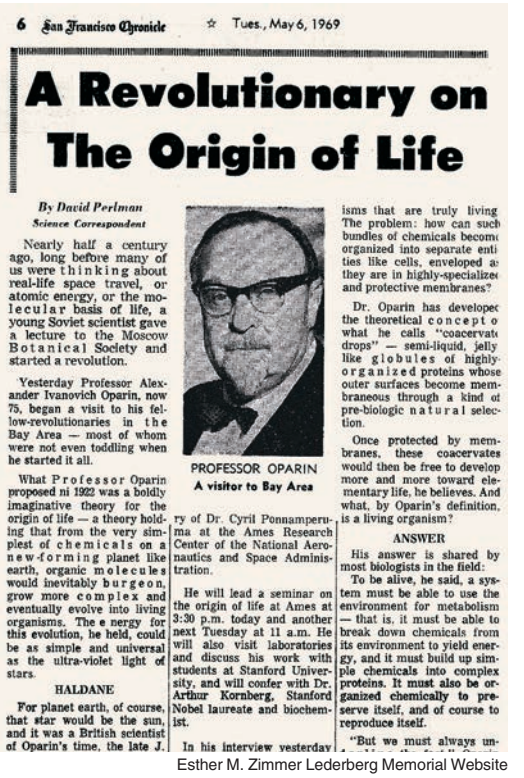
The same year as the Origin of Life Symposium, American scientist Stanley Miller gave a presentation before the Soviet Academy of Sciences on work which was supposed to have practically confirmed Oparin's thesis. Oparin had learned of the results in 1953, and had personally invited Miller to attend the symposium.

Miller had teamed up with, not so surprisingly, a student of Niels Bohr, Harold Urey.[29] These two experimentalists intended to prove Oparin right by attempting to synthesize the veritable primordial soup. In 1951 Urey had suggested, "that experimentation on the production of organic compounds from water and methane... and the possible effects of electric discharges on the reaction [simulating] electric storms... would be most profitable."

29. Berkowitz, op cit., p. 125.

This was exactly what Urey and Miller set out to do. Their experiment was a simple setup involving two globe-shaped flasks, one containing the contents of the supposed primordial atmosphere (a mixture of methane, ammonia, and hydrogen), and the other containing the primordial sea (water) which when heated, fed water vapor into the other flask. With the flip of an electricity switch sparks flew between the electrodes in the gas mixture. Within a week, the "sea" had turned brown, and the higher chamber, which had contained the "atmosphere" was coated in an oily sludge. They had created life!

Not quite... really, not at all. Five amino acids were able to be separated out, three of them known to be found in most living things, composing their proteins: glycine, aspartic acid, and alanine. More modern versions of the experiment claim to have isolated more than these original five.



6 San Francisco Chronicle ☆ Tues., May 6, 1969

# A Revolutionary on The Origin of Life

By David Perlman
Science Correspondent

Nearly half a century ago, long before many of us were thinking about real-life space travel, or atomic energy, or the molecular basis of life, a young Soviet scientist gave a lecture to the Moscow Botanical Society and started a revolution.

Yesterday Professor Alexander Ivanovich Oparin, now 75, began a visit to his fellow-revolutionaries in the Bay Area — most of whom were not even toddling when he started it all.

What Professor Oparin proposed ni 1922 was a boldly imaginative theory for the origin of life — a theory holding that from the very simplest of chemicals on a new-forming planet like earth, organic molecules would inevitably burgeon, grow more complex and eventually evolve into living organisms. The energy for this evolution, he held, could be as simple and universal as the ultra-violet light of stars.

HALDANE

For planet earth, of course, that star would be the sun, and it was a British scientist of Oparin's time, the late J.

PROFESSOR OPARIN
A visitor to Bay Area

ry of Dr. Cyril Ponnamperuma at the Ames Research Center of the National Aeronautics and Space Administration.

He will lead a seminar on the origin of life at Ames at 3:30 p.m. today and another next Tuesday at 11 a.m. He will also visit laboratories and discuss his work with students at Stanford University, and will confer with Dr. Arthur Kornberg, Stanford Nobel laureate and biochemist.

In his interview yesterday

isms that are truly living. The problem: how can such bundles of chemicals become organized into separate entities like cells, enveloped as they are in highly-specialized and protective membranes?

Dr. Oparin has developed the theoretical concept of what he calls "coacervate drops" — semi-liquid, jelly like globules of highly-organized proteins whose outer surfaces become membraneous through a kind of pre-biologic natural selection.

Once protected by membranes, these coacervates would then be free to develop more and more toward elementary life, he believes. And what, by Oparin's definition, is a living organism?

ANSWER

His answer is shared by most biologists in the field:

To be alive, he said, a system must be able to use the environment for metabolism — that is, it must be able to break down chemicals from its environment to yield energy, and it must build up simple chemicals into complex proteins. It must also be organized chemically to preserve itself, and of course to reproduce itself.

"But we must always un-

Esther M. Zimmer Lederberg Memorial Website

*San Francisco Chronicle article detailing Oparin's trip to NASA Ames in 1969.*

On the one hand, no one has ever demonstrated that a living organism can emerge from a pile of amino acids.

On the other hand, the lack of success of these experiments is more interestingly shown by the fact that the amino acids produced in the original Miller-Urey experiments, as well as all subsequent similar experiments, have failed to produce amino acids which posses the unique left-handedness which they exhibit in living organisms, but rather produce racemic mixtures, which consist of both left and and right enantiomers.

Also interesting is recent work and discussion regarding the problematic nature of Oparin's "coacervates," the colloidal gels which he claimed would "develop" in his theoretical primordial soup, formed of polypeptides and polysaccharides. To this day, despite the efforts of the many scientists who seek to prove his thesis, polysaccharides have not been created abiogenically.[30]

This more modern history surrounding Oparin's work and legacy leads to the next chapter in this story: Oparin's trip to the NASA Ames Research Center in 1969. This trip may begin to explain how it is that Oparin has come to be viewed as the virtual father of exobiology, or astrobiology, as it has come to be called.

### Oparin's influence

Astrobiologists represent probably the only community of scientists for whom Alexander Oparin is practically a household name. At the Astrobiology Science Conference 2012, held in Altanta, Georgia, this author had the opportunity to present a poster on the views of Vernadsky and Oparin with respect to the recent Kepler spacecraft's missions searching for habitable planets. Almost all of the dozens of scientists spoken with were quite familiar with Oparin's work, and only one really knew much of anything about Vernadsky, correctly exclaiming, "That towering figure of science!"

The reason for this discrepancy becomes clearer when Oparin's 1969 trip to NASA Ames is taken into account.

From an article in the *San Francisco Chronicle*:

> Nearly half a century ago, long before many of us were thinking about real-life space travel, or atomic energy, or the molecular basis of life, a young Soviet scientist gave a lecture to the Moscow Botanical Society and started a revolution.
>
> Yesterday, Professor Alexander Ivanovich Oparin, now 75, began a visit to his fellow-revolutionaries in the Bay Area—most of whom were not even toddling when he started it all.
>
> What professor Oparin proposed in 1922 was a boldly imaginative theory for the origin of life—a theory holding that from the very simplest of chemicals on a new-forming planet like earth, organic molecules would inevitably burgeon, grow more complex and eventually evolve into living organisms The energy for this evolution, he held, could be as simple and universal as the ultra-violet light of stars...[31]

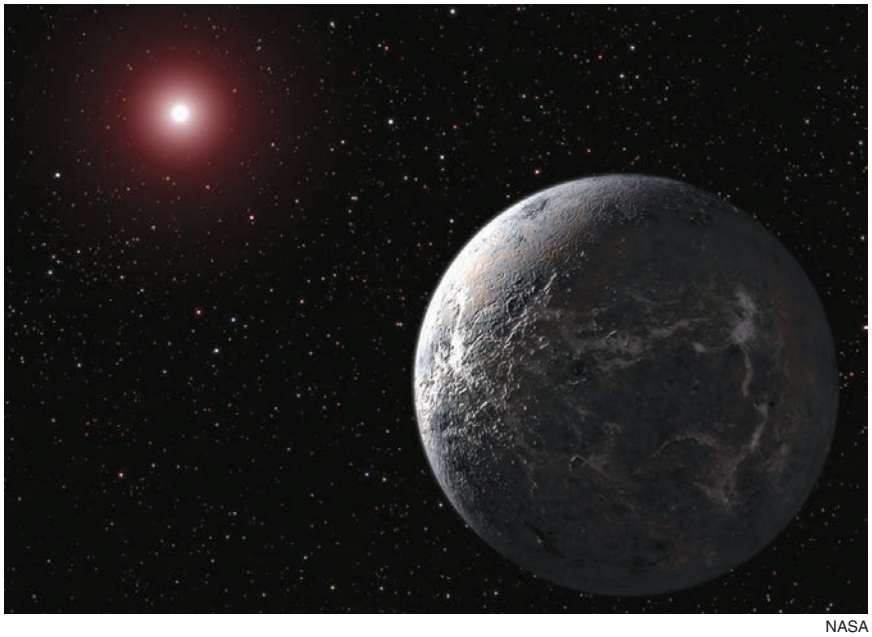
The article then reviewed the work of Haldane and discussed the two seminars which Oparin would host, in addition to meetings at Stanford University. It included commentary from Oparin, who admitted that his concepts

30. See abstract of Vera Kolb submitted to 2012 NASA Astrobiology Conference: "On the Applicability of Oparin's coacervates to modern prebiotic chemistry" at: http://abscicon2012.arc.nasa.gov/abstracts/

31. Perlman, David, "A Revolutionary on the Origin of Life," *San Francisco Chronicle*, May 6, 1969.

were not entirely original, and that many of them were inspired by the ideas and tradition of Aristotle.[32]

More investigation into the circumstances surrounding this trip would certainly be of interest, but it is indicative of the promotion of the reductionist ideas of Oparin, known at his time, and by his own words, to be more of a political tool than a scientist.



NASA

*The field of astrobiology has been greatly influenced by Oparin's work.*

**Deeper Implications**

Oparin's ideas and their impact have surely spread outside of the more limited field of astrobiology. Reductionist thinking has become all-pervasive: from economic policy-making governed by the doctrine of free trade, which virtually bans any guiding future orientation, to other work in the sciences and music. Oparin's theory of the parts organizing themselves is not unlike the theories of modern musical composition.

Oparin appears to have assumed that the domain of chemistry is safe from attacks against reductionism. His own Russian predeccesors knew better than this. Below is a quote from Dmitri Mendeleev, the renowned chemist and also one of the most famous economists of his day. Mendeleev, who discovered the organization of chemical elements which we know as the Periodic Table, was no reductionist. His scientific work was apparently restricted to the material, chemical domain, but he stated that the study of so-called matter must be done with a view towards the real (not simply "emergent") higher processes in which it is able to participate, contrary to the approach of Alexander Oparin.

> Thought, which has no resting place in the history of knowledge, is free to wander in these unlimited regions whither and how it pleases, and may therefore return to the point from which it started in the dawn of science. I do not in the least censure such thought in any respect, but when my thoughts turn to this region they always rest steadfastly on the fact that we are unable to comprehend matter, force, and the soul in their substance or reality, but are only able to study them in their manifestations in which they are invariably united together, and that beyond their inherent indestructibility they also have their tangible, common, peculiar signs or properties which should be studied in every possible aspect.[33]

Vernadsky's work on the three domains which he called the lithosphere, biosphere, and noösphere, was also governed by a top-down conception of their ordering. His work focused on the distinction of non-living and living matter; the unique dissymmetry of living matter is indicative of the unique potentials of living matter more broadly which cannot be generated "from below." Pierre Curie had formulated this in a similar way—stating that the dissymmetry of an effect must be present in its cause, and also adding that an effect could not have a greater dissymmetry than its cause. Vernadsky's work also focused on the unique power of the noösphere—of human cognition.

In a 1931 presentation to the Leningrad Society of Naturalists, "On the Conditions of the Appearance of Life on Earth," Vernadsky, while not naming Oparin, provided an interesting, playful yet devastating hypothesis (from Oparin's standpoint) of the only way a synthesis of life could occur: it could only occur as a synthesis from the top-down—as a synthesis generated by the noösphere, with a unique understanding of the fundamental distinction of life from non-life, such as the unique dissymmetry it displays and requires:

> Man can create in laboratories environments of enantiomorphic structure, possessing some properties of dissymmetric enantiomorphic structure, characteristic of life. However, he has not succeeded up until now in creating a dissymmetrical environment analogous to that which we find in the interior of organisms.

32. See the Esther M. Zimmer Lederberg archive at: http://www.estherlederberg.com/Oparin/Opar2Z.html#IMAGE

33. Mendeleev, Dmitri, *Principles of Chemistry*, Kraus Reprint Co., 1969, Vol. 2, p. 30.

> The study of the action upon living phenomena by environments formed by left or right handed circularly polarized light opens a field of great interest, but it is not a dissymmetrical environment similar to that of organisms. It is necessary still, always, to have in view, according to the principle of Curie, that the activity of man would be itself a dissymmetrical cause and the creation by him of a dissymmetrical environment, responding to life, would be a normal event, from the point of view of dissymmetry.[34]

Oparin's intention to reduce living matter to its non-living constituents was a major assumption, and something which he could not prove, but only suggest. But it is no coincidence that by means of such a theory, the notion of directionality and intention which we see in human and non-human life could also possibly be reduced to simple parts which interact only mechanically, and by chance produce "life," "creativity," and their products as a kind of epiphenomenon. It is likely that for this reason Oparin's work has been "popularized," since it fit the agenda of an oligarchical faction largely based in Great Britain who explicitly viewed science as a means of control, and sought to prevent man's economic progress. Making popular a doctrine of reductionism, blurring the lines between living and non-living matter, and by analogy, man and beast, aids in encouraging man to abandon anything which he should demand as a unique, creative species.

**Vindicate Vernadsky: End Oparin's Scientific Tyranny**

To properly honor Vladimir Vernadsky's 150th birthday, we should have a goal to restore in the minds of many, especially within the scientific community, the image of Vernadsky as that one attendee at the 2012 NASA astrobiology conference said to the author—as the "towering figure of science" which he is. With this comes the necessity to abandon the politically motivated and unrigorous conceptions of Alexander Oparin, and the more general doctrine of reductionism which infects our culture, our science, and our policy-making. With respect to investigations in biology, we should, as Lyndon LaRouche once commented, seek a definition of life "which is of the ontological character of metaphor." Vladimir Vernadsky would surely approve.

*The author is indebted to the work of Allen Douglas, Rachel Douglas, William C. Jones, and Craig Isherwood.*

34. Vernadsky, V.I., "Sur les conditions de l'apparition de la vie sur la Terre," speech to the Leningrad Society of Naturalists, 1931. French translation reviewed by Vernadsky.