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ON THE STRUGGLE OF SCIENTISTS WITH THE EFFECTS OF POSITIVIST MYTHS FUNCTIONING IN THE LIFE SCIENCES

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ABSTRACT

The aim of this article is to examine whether the "seven myths" identified and presented by Uroboros in "In venenoso Dracone ...," more than thirty years ago still function in the academic community. It also aims to address whether there are indications that this state has undergone a change. It seems that naturalists found that excessive adherence to a physicalist style of doing science severely limits research work. At the same time, scientists often grapple with the consequences of implementing physicalism and stumble while addressing philosophical issues.

Keywords: Positivist mythology, meta-scientific and meta-philosophical mythology, philosophy of biology, philosophy of protobiology, research on the origins of life.

1. INTRODUCTION

"In venenoso Dracone summam medicinam inesse" is an article written in 1991, presenting the seven myths of life sciences (Ługowski, 1998). It is worth discussing to what level naturalists are still struggling with the effects of their influence. It also has to be recalled, that there are unavoidable consequences of the fact, that Life sciences "inherit" theoretical problems of sciences (in the philosophical and methodological layers), from which they draw practical solutions and knowledge. The issue of the origin of life requires a specific metaphysical and methodological perspective. Although genesis of life abounds in seemingly Gordian knots (with maybe the most popular chicken—egg (or hen)) problem), it is interesting how scientists try to cut them—perhaps soon the next ones will prove a little easier to untangle than originally thought. For life sciences, both in a logical and propaedeutic sense, the issue of the origins of life is potentially immensely significant. The question of the origin of life necessitates a well-considered, distinct philo-

sophical perspective, given its multidisciplinary nature. These challenges, while demanding, do not necessarily encapsulate the core issues that protobiologists face in their work. A more crucial aspect is the thoughtful examination of the theoretical underpinnings. Many of these theoretical challenges stem from protobiologists' quest for interpretation of groundbreaking discoveries related to the properties of RNA and DNA, yet the myths identified by Uroboros have had a significant impact on the entire interdiscipline. Have naturalists managed to overcome, at least partially, the hallucinations induced by the neo-positivist fragmentation of thoughts?

When there was a need to familiarize students of philosophy[1] with the philosophy of protobiological theories, I found it necessary to base my work on the aforementioned text. I believe that despite the passage of thirty years, "*In venenoso Dracone* ..." constitutes a valuable collection of useful guidelines for students to develop critical thinking in relation to the evolving field of protobiology. It may contribute to raising new questions and helps to uncover the mystifications of naturalists. Let me allude that the article caused emotions.[2]

It is a well-known belief that academic textbooks report the basics and advancement of a given discipline. Similarly, the presence of an issue in academic courses at universities may be an indicator of the degree of its development. Unfortunately, in the case of the origin of life sciences situation that contradicts common sense feelings occurs. However, Antonio Lazcano, a Mexican protobiologist, who devoted most of his professional life to abiogenesis noted: "the study of appearance of life is a mature, well-established field of scientific inquiry" (Lazcano, 2010, p. 14).

It should be noted that it is very difficult to get an integrated picture of a research field drawing knowledge, methods, and experimental practices from so many other disciplines. Its theoretical foundations were presented in the 20s of the 20th century. The fragmentation that Duane L. Rohlfing already mentioned in 1984 (pp. 30–31), makes it difficult to build a coherent picture of the protobiology state. Few academic textbooks have been written so far and are mainly published "under the banner" of astrobiology. The deficit will contribute to perpetuating the false notion that it is a fledgling discipline, with inappropriate theoretical and philosophical foundations. In order to examine the validity of the myths presented by Uroboros in "In venenoso Dracone ..." I explored each one separately and because point of

[1] In the summer semester 2019–2020, I ran a philosophy laboratory for philosophy students.

[2] I formulated my observations on the basis of correspondence with students. Here are, for example, the words written by one of them: "Uroboros' text made me very happy and interested as it is a response, one of the few, to my fundamental objections and distance to the dominant scientific mainstream. What should be obvious and clear as the sun, that there are no neutral systems (because each approach, position, assumption is to some extent already burdened by the very nature of things, even from the researcher's worldview and his motives, prejudices [...] or finally the adopted methodology) is often not taken into account at all."

view in his article is broader, I narrowed the perspective to the issue of abiogenesis.

2. THE MYTH OF PHILOSOPHICAL SELF-AWARENESS OF SCIENTISTS

According to the myth, scientists are able to distinguish science from philosophy as well as good philosophy from bad, and they know on what philosophical foundations their field of science and the theory they co-create lies. What is the basic for the myth of self-awareness? The answer to such question lies in the neo-positivist attachment to physicalist methodology.

Admittedly, such a spectacular clumsiness as the approval[3] by Robert Shapiro and Robert Jastrow of a 1984 creationist publication by Thaxton, Bradley and Olsen did not occur. However, some scientists—prominent researchers, popularisers in the field of abiogenesis, that are more or less sympathetic with creationism—are still triumphant. In what follows, I turn for an example to Paul Davies, but first it's worth recalling *frozen accident* standpoint.

The still popular notion of the emergence of life as a frozen accident was presented in Jacques Monod's classic book *Le hasard et la nécessité* (1970). Monod embraced the physicalist ideal of practicing science. This fact is evident in chapter VI of his book. Monod also believed that "Platonic" elements in science were inevitable. According to him, in the midst of the countless number of individual phenomena, scientists search for the unchangeable. In this context, the guiding principle for the micro scale is the Heisenberg uncertainty principle honoured by Monod. After all, mutations happen on a micro scale (Monod, 1972, pp. 114–115). Monod was probably aware of the adversarial consequences of the philosophical positions he invoked. As an existentialist, you must embrace the concept of a "chance." You also do not have to be a Platonist to use their intellectual tools. As for the philosophical stance—he postulated the idea of a universe without causality. He assumed that natural selection was operating very early in the emergence of life. A French naturalist used the power of selection to explain the advanced mechanism present in cells. Monod opposed the idea of destiny that precedes existence. "In his research, Jacques Monod focused on the issue of genomic regulation of metabolism in modern, highly specialized bacteria"—as Smith Morowitz noticed, they found the sources of Monod's philosophical position in his professional experience (Smith, Morowitz, 2016, p. 68).

A contemporary representative of the Monod's position is Eugene Viktorovich Koonin—a Russian-American biologist, an expert in evolutionary and computational biology—who in a 2017 article with the significant

[3] It was detected and noted by Uroboros in the mentioned article.

title: *Frozen Accident Pushing 50: Stereochemistry, Expansion, and Chance in the Evolution of the Genetic Code* reminded about the "chance or necessity" dispute, while writing: "random and (extremely) rare events are part and parcel of the evolution of life, even if this is unpalatable to some on philosophical grounds."

The inevitability of a philosophical perspective is striking, especially when naturalists confess their faults. Koonin is an example of scientist, who while determined to exclude the philosophical context from the publications, recognizes its importance. In 2012, E. V. Koonin with Didier Raoult wrote the preface preceding the collection of articles published in Frontiers in Cellular and Infectious Microbiology. They declared there that:

> "Clearly, we are moving away from the rigid positivist views that dominated rational thinking in Darwin's day and inevitably influenced his thought to a much richer, dynamic philosophical framework of incessant change heavily affected by chance that reverberates with the post-modern thought of the twentieth century but also harks back to the great pre-Socratic philosophers of Greece, Democritus, Parmenides, Heraclitus, and Empedocles" (Raoult, Koonin, 2012, p. 2).

Robert Hazen, an American mineralogist and astrobiologist (Hazen, 2017, p. 7), states, however, that the dichotomy of "chance versus necessity" is misleading. He draws attention to the time and space limitations of laboratory experiments. In particular, natural scientists are now developing strategies to increase the likelihood of observing reactions considered unlikely to be carried out in the laboratory. What was Hazen's motive for trying to eliminate this dichotomy? Now, on his website he states that many scholars have taken a firm philosophical position, which he formulated as follows:

> "Assuming that life arose as a natural chemical process (as opposed to an act of divine intervention), there exists a continuum of possibilities [...] Nevertheless, many scientists have taken a strong public stand; many researchers conclude that life is a cosmic imperative. Perhaps this unsupported conclusion arises from a realization that unambiguous experimental results are possible only if life is an inevitable consequence of geochemical processes."

On the same page there is a note that cannot be underestimated, namely:

> "The concept of a sequence of discrete emergences is useful and appealing in experimental and theoretical studies of the origin of life, because it reduces an immensely complex historical process to a succession of several, more manageable chemical episodes. Experimental programs are now elucidating the possible first steps in the geochemical emergence of life."[4]

[4] Quotations from https://hazen.carnegiescience.edu/lectures/lecture-topics

Both materials provided by Hazen and the above-mentioned article from 2017 confirm the supposition that the myth of philosophical awareness still functions among scientists. Hazen avoided clarifying his own position. When announcing a philosophical statement, he mentioned, at best, different attitudes towards the problem of origins of life, the causes of which he had seen in different methodological standards. Where, however, their diversity comes from, he remained silent.

Nevertheless, on one matter, Hazen expresses a clear position. In a series of lectures on the subject taught in 2017 by him and called *Big Ideas in Science* at Carnegie Mellon University in Pittsburgh, Pennsylvania, the thirteenth is about evolution. In presentation accessible for anyone, Hazen shares his opinion on status of Intelligent Design proponents: "If biological complexity can be shown to arise spontaneously as the result of natural processes, then ID is unnecessary" (slide 7). This statement reflects a nonchalant approach to the challenges faced by researchers in the field of Origins. Hazen expresses an attitude that shows a lack of appreciation for his own efforts and those of other protobiologists. The work of scientists in the Origins of Life research field involves coping with the continuing presence of many significant theoretical and experimental uncertainties. Therefore, it is necessary to emphasize existing body of knowledge, rather than succumb to the false belief that evidence for the material origin of life gained in far future will stop creationists now and convince them and their supporters that there is no need to resort to "miracles," "agents" and "divine interventions."

Even conducting research based on the classical theory of chemical evolution does not protect against attempts to exploit the results and name of the scientist. In the second half of the 20th century Melvin Calvin conducted such research in the field of protobiology in accordance with the classical theory of Origins. Unfortunately, he did not specify his ontological position. For this reason, he is sometimes the subject of pseudo-scientific publications. There are many indications that one of the reasons for the immediate interest of pseudo-scientists in Calvin was his scientific cooperation with Dean H. Kenyon—one of the authors of the book *Biochemical Predestination* (1969), written before Kenyon became a radical creationist and then an advocate of intelligent design.

Naturalists often exhibit naivety when it comes to philosophical self-awareness. Sarah Walker and Paul Davies, for example, assume that information gains causal efficacy in relation to the matter in which it is recorded. This—as it is claimed by Walker and Davies—an abstract and non-physical system unit, i.e. algorithmic information, is the causative factor operating in the material substrate (Walker, Davies, 2013, p. 6). From the perspective of these American physicists, matter is passive and information is active. Their view bears similarities to the position of proponents of intelligent design.

This is because the authors do not address the problem of the origin of information, they accept its existence as a kind of axiom.

In 2019, Paul Davies' book *The Demon in the Machine. How Hidden Webs of Information Are Solving the Mystery of Life* was published. In its sixth chapter titled "Almost a Miracle," he writes:

> "Scenarios in which chemistry 'strives' towards life are patently absurd. The same problem does not occur once life gets going, because natural selection can ratchet up the gains and DNA storage can lock them in. But chemistry without natural selection has no recourse to such mechanisms" (Davies 2019, p. 144).

In a footnote we find:

> "There is a long history of what might be called 'molecular Darwinism' in which 'naked' molecules are able to replicate with varying efficiency and natural selection filters out the best. The so-called RNA world theory falls into this category. Though these studies are instructive, they are very contrived and require carefully managed human intervention (e.g. to prepare materials, to do the selecting) to accomplish anything. Relevance to the natural world is far from obvious."

Davies' book caught the attention and received a response from Robert Frederick Shedinger (American Professor of Religion at Luther College, Iowa), which was published by *Evolution News & Science* associated with Discovery Institute's Center for Science & Culture: "No better advertisements for intelligent design exist than works written by establishment scientists that unintentionally make design arguments" writes Shedinger, also: "he entirely ignores the question of the origin of the information processing system itself, which he has already pronounced as beyond the ability of chemistry alone to explain."[5]

The author of the present article failed to find any traces of a response from Davies. But in his book from 2019, he wrote:

> "If the new informational state-dependent laws I am proposing operated only in living matter, it would be just another version of vitalism. The whole purpose of a theory that unifies physics and biology is to remove any barrier separating them, in which case the new informational laws might be expected to bleed from the living world into the non-living world" (Davies, 2019, p. 177).

It seems that Davies is just echoing Schrödinger's challenge.

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[5] https://evolutionnews.org/2020/03/hey-paul-davies-your-id-is-showing/

3. THE SECOND MYTH: THERE IS ONLY ONE TRUE SCIENCE AND ONE METHODOLOGY

The meta-scientific myth of positivist origin is the one about "the only scientific" methodology, about the possibility of science without philosophical foundations, and about the "impartial" scientific analysis. The methodology of positivist provenance leads scientists no to search for specific, substantive laws that could explain behaviour of matter under conditions during collapse to life, but rather to search for black boxes expected by creationist. Despite this, evolutionary biologists have been studying changes of patterns in nature. In the article by Uroboros the change in the way of reproduction of living creatures was shown. The mentioned example seems to have a high educational value, because it is known to evolutionary biologists, although is rarely placed in the context of the variability of regularities in nature. The evolution of sexual reproduction is an adaptive trait common to almost all multicellular organisms.

Carol Cleland recently tried to come up against the second myth, proposing alternative approach to the astrobiological problem of biosignatures and the definition of life in. "For as the history of science reveals, anomalies are a driving force behind scientific discovery and yet (when encountered) are rarely recognized for what they represent because they violate core theoretical beliefs about the phenomena concerned" (Cleland, 2019, p. 722). So, the philosopher proposed a research strategy that, as she believes, opens up new opportunities for seekers of extra-terrestrial life. She found inspiration in Thomas Kuhn's concept of anomalies. In her opinion, there are concerns that the current biological concept of life may have been significantly misleading. If (as most astrobiologists believe) Life as We Know It today (LAWI) originated from LUCA (Last Universal Common Ancestor)—it represents a single example that may be unrepresentative in poorly understood, or even unknown ways.

The more the form of extra-terrestrial microbes differs from those known to us, the more likely it will be classified, based on the earth-centered definition of life, as another mysterious phenomenon of the inanimate world. How successful, however, will her idea be in transforming into a tangible research project? The road from a metaphysical thought experiment to a well-theorized research program is a long one. In contemporary times, justifying novel ways of thinking gained by logical negation of what is known could be challenging.

According to Cleland, the strategy of searching for extra-terrestrial life recommended by her has a psychological flaw: it is unlikely to give a quick and decisive answer to the question of whether a mysterious phenomenon encountered in another world is a product of biology. Since so far, no accepted definition of life has been developed, the author worries unnecessari-

ly. Her recommendation seems not to change anything, she just reminds the readers of well-known problem of anthropocentrism.

Cleland criticizes the previous practices of scientists studying the issues of extra-terrestrial life. She seems to believe that naturalists work in the realms imagined by Kuhn. Therefore, she writes that paradigms play an important role in scientific practice, but may hinder the exploration of nature by discouraging certain directions of research and affect the interpretation of data. According to Kuhn, in the absence of a crisis, the paradigm blinds researchers to the presence of anomalies (Cleland 2019, p. 723). Anomalies are as common in the biological sciences as they are in physics, says the philosopher. However, it is not easy to describe the plane where one can make a sensible comparison of anomalies in different sciences. It is likely a statement concerning the credibility of referring to Kuhn's model of phase transitions for astrobiology. Does this information contribute to the myriad challenges of protobiology? She pointed out two examples of important anomalies: the discovery of ribozymes by Thomas Cech and the discovery of *Archaea* by Carl Woese and George E. Fox.

In the search for extra-terrestrial life, the author proposed that it is necessary to consider features that are not essential for life but are rather universal to terrestrial forms. In her opinion, the purpose of contemporary criteria is not to provide a decision-making procedure for estimating the probability that an extra-terrestrial phenomenon is a product of life. Unlike definitional criteria, these temporary criteria are open to revision or even rejection in light of empirical discoveries and new theoretical developments. The allegedly fundamental features of life should be included as preliminary criteria and used together in the study of extra-terrestrial environments to detect biologically promising abnormalities, regardless of which trait is believed to be more basic to life. The discussion of upcoming space missions considers a wide range of potential biosignatures that may be of use. However, it is doubtful that scientists did not previously take into account features universal to life when planning research projects. Examples of biosignatures given by Cleland are worth mentioning though. She recalled few facts from the biochemistry of life. The proteins present in LAWI are synthesized from as little as 20 L-amino acids, despite the fact that natural processes produce over 100 amino acids with mixed chirality. Hence, the mysterious enrichment of a small subset of homochiral amino acids, whether or not the same as in "our" life, could be a definitive biology.

Another promising candidate for the role of contemporary criterion—from Cleland's point of view—would be the way organisms modify the environment. Why? It is so, because many microorganisms tend to form "communitarian structures," says Cleland. Sedimentary formations are, for example, easier to detect than individual microbes or their fossils. It is not clear, however, whether microbes of other worlds would form similar struc-

tures in analogous environments, because conditions will inevitably differ from those on Earth in a way that can be significant and in part because many of the microorganisms on Earth do not form structures.

Potential biological anomalies are for Cleland situated on the border of a living and inanimate system. How such state would be recognized, should be of importance though. Only more detailed answers based on current knowledge and precedent examples would help imagine more possibilities. But if there were such, we would have had the answers. Cleland knows that, because she understands that it is very rare to predict an anomaly before it is encountered. The search for potentially biological anomalies is then the search for phenomena that "should not exist." This term should be elucidated more precisely to show its difference from "frozen accident." Perhaps Cleland did it in other publications.

Another exemplification of intellectual trends in origins-of-life sciences is The Phosphine Case on Venus. In September 2020, word spread around the world about the discovery of phosphine (PH_3) in Venus' atmosphere. As it is known the environmental conditions on the sister planet are hostile to "life as we know it "(LAWI). The research group, reporting the results, mentioned in the last publication the earlier postulation of phosphine as a candidate for biosignature for exoplanets (Sousa-Silva et al., 2019). At first it was thought that J. Greaves had detected an absorption line—a signal derived from phosphine. Today it is known that a measurement error related to calibration has occurred. However, researchers warned that the observation needed further confirmation. In less than a month, the results were compared with surveys of the spectrum at other wavelengths (Encrenaz et al., 2020, p. 1).

Measurement error is a fundamental problem in epistemology and has a long history of theoretical development. The assumption that a fixed true value of it can be found is conceptually related to Laplace's stance of strict determinism as well as the notion that every event has a well-defined cause. The development of quantum mechanics in the first three decades of the twentieth century finally allowed us to gather sufficiently strong evidence against the fantasy of certainty of measurements. The impossibility of obtaining an accurate measurement is not due to technical imperfections in the equipment, but to the fundamental principle of uncertainty formulated by Werner Heisenberg (Suppes, 1997, p. 5).

In the context of the contemporary criterion of Cleland, the matter of phosphine is cognitively valuable. Although Sousa-Silva and colleagues have shown excessive optimism, their work is proof that space exploration, data analysis in search for life in the universe, should be taken seriously enough as subject to the methodological standards developed so far. Therefore, scientists are not satisfied with hypothetical scenarios but seek their confirmation. New, less obvious biosignatures are selected, and the mistakes of scien-

tists are revealed which makes them the basis for drawing conclusions and more precise hypotheses.

4. THE THIRD MYTH: THE SPIRIT OF MODERN BIOLOGY IS FULLY MANIFESTED IN MOLECULAR BIOLOGY

Since the 1990s, this myth has been widely recognized and many philosophizing naturalists and philosophers are cracking down on it. Currently, the systemic perspective is triumphant. A separate issue is to consider whether this is a change in the nomenclature for earlier ways of solving problems in science, new fashion, and to what extent a real change of thought.

For example, in 2012 Addy Pross poetically expressed his opinion on this matter in the book *What is Life? How Chemistry Becomes Biology*: "The spectacular advances in molecular biology, reductionist in its approach, have not opened the gates to the Promised Land. Our attempt to view biological systems as mechanical-materialistic machines have failed dismally" (Pross 2012, p. 115).

This myth was noticed and faced among others by Carl Woese and Nigel Goldenfield in an article written in 2009. The authors presented the figure of Martinus Beijerinck (1851–1931). The microbiologist they recalled realized that an organism cannot be understood outside of the ecology and the structures in which it is located. It seemed to him that the world of microbes "invites" to study the origins of life and its evolution. Jan Kluyver (1888–1956), his successor, unduly influenced by advances in biochemistry, was to direct microbiology on a reductionist path by treating microorganisms as bags of interesting biochemistry. The use of reductionist metaphysics to understand the biological world was promising, but turned out to be a dead end before reaching the ultimate goal of molecular biology: to understand the essence of "life" and get an answer to the question of how molecules become "living" (Woese, Goldenfield, 2009, p. 18).

In the twentieth century, molecular biology accepted evolution simply as a biological epiphenomenology, "historical case"—meaning that the problem of evolution was regarded as unrelated to any fundamental understanding of living systems. For most of a century, the discipline did not even have a proper understanding of itself—the authors noted. Until recently, microbiologists did not pay attention to evolution. Molecular biologists have accepted the Synthetic Theory of Evolution as a complete and unchallenged theory —giving the impression that it is a solved scientific problem whose roots lie solely in the molecular paradigm. Twentieth-century biology has failed to appreciate that biological organization is an evolutionary problem—and that it cannot be understood unless properly formulated as a fluid form.

Biology must become self-aware of its theoretical basis: the evolutionary process. Only then it would become more than an unrelated set of facts.

In 2022 Patrick Forterre wrote an article that commemorates Carl Woese. On this occasion he referred to Woese's perception of molecular biology. "Molecular biology without evolution was criticized by Carl Woese as reductionism in action. This was a right criticism of reductionist metaphysics that translates a methodological approach into a broad view of the world, with some microbiologists "treating microorganisms effectively as bags of interesting biochemistry" (Forterre, 2022, p. 365). His own opinion is that the scientific process should be a combination of reductionist and holistic approaches because "the discovery of *Archaea* based on single-gene analyses has been a triumph of methodological reductionism" (Forterre, 2022, p. 365).

Michel Morange—a professor of biology at École Normale Supérieure, a historian of molecular biology—is convinced that the spirit of molecular biology has changed since 1960s but Monod anticipated some recent transformations of the discipline. Monods' "blind admiration of modern physics led him [...] to state that the origin of chance in evolution was the uncertainty principle recently discovered by quantum physicists" (Morange, 2015, p. 382). He accurately notes that "the ambition of Monod and of many molecular biologists was also to imitate the way of thinking and working of physicists. The movement was initiated by Max Delbrück, who brought the habits of young German quantum physicists to California" (Morange, 2015, p. 383). But "Monod anticipated some of the most recent developments in biology: physical models are playing an increasing part in biology, and efforts to dovetail functional and evolutionary explanations have recently flourished" (Morange, 2015, p. 384). The conviction, that the harmonization of diverse explanatory approaches is worth attaining, finds similar endorsement from the philosopher of biology, Patrick Forterre.

It has to be remembered, that there are issues more obvious for experienced naturalists than for philosophers of science (in particular, of biology/protobiology). Some of them can be found in the earlier text by Patrick Forterre. In 2012 he tried to counter the attack on Darwinian explanation of evolution in *Darwin's goldmine is still open: variation and selection run the world*. In the article, he presented what are the achievements of molecular biology and what is its fate. Forterre made his readers aware that the great accomplishment of molecular biology was "revealing the molecular mechanisms behind the multiplication and variations of living organisms" (Forterre, 2012, p. 3). Molecular biologists could produce artificial variations in the genetic material; therefore, evolution became subject to experiments. The microbiologist offers a definitive assessment regarding the future of the discipline.

> "Molecular biologists are now out of fashion and spotlights focus on genomists and synthetic biologists. Possibly because Darwin's contribution was clearly recognized by the pioneers of molecular biology (now often accused of reductionism) it seems that genomists and some modern evolutionists look for another hero apparently fitting better with 'holistic views' and 'systemic biology' " (Forterre, 2012, p. 3).

Forterre makes the reader aware that horizontal gene transfer was known to the pioneers of molecular biology, and therefore the sense of reconstructing microbial evolution was doubted (Fortere, 2012, p. 6). He concludes that although reconstruction of the history of life itself is immensely difficult, "we should not try to escape these difficulties by replacing trees by networks. In the meantime, we should go back to the fields to complete our inventory of microbes and their viruses, and be grateful to Darwin, who teaches us to look nature with open eyes beyond the veil of ideologies (Forterre, 2012, p. 11). Even if Forterre gently pushes the door that was previously open, he emphasizes an important point: succumbing to trends should not exceed a certain degree. The change in concepts and methods must be well-justified. However, there is no reason why various styles of conducting science cannot operate concurrently alongside each other.

John Sutherland believes that a true understanding of biology must include knowledge of its chemical origins, and that understanding the chemical phenomena that gave rise to biology—cell structure, central dogma, genetic code—are fundamental aspects of the life sciences. In addition, understanding how existing biology came about can help design "synthetic" variations of it. In the past, in order to obtain a minimal organism, Sutherland explains, people tried to simplify the problem. It was believed that in order to obtain individual subsystems, different chemicals were needed, which could "collide" with each other. This is why there was a belief that one of the subsystems had to come first. The essential point for Sutherland is to return to one-pot chemistry. He talks about going back because this approach has been used before. The concept of a multiple-component, multiple-product reaction was anathema to most organic chemists until recently (Powner, Sutherland, 2011, p. 2870). Now Sutherland supports one-pot chemistry with knowledge of flow chemistry (Sutherland, 2020).[6]

[6] Physical Sciences Division, University of Chicago (2020), Origins of life systems chemistry, John Sutherland, Cambridge, (video); https://www.youtube.com/watch?v=e5g550gdvW8&t=4735s

5. THE FOURTH MYTH: LIVING THINGS DO NOT EXIST (OR AT LEAST THEY SHOULD NOT EXIST)

In 2007, earlier mentioned Koonin, put forward a model (The Biological Big Bang model) for the major transitions in evolution inspired by the cosmological concept of eternal inflation. Koonin proposed a model that "predicts" the random emergence of an infinite number of complex systems even if the probability of complexity emerging in any region of the multiverse is extremely low. Such a change of perspective would have profound consequences for the history of every phenomenon—including life on Earth. Eternal inflation is the candidate for a viable alternative that is unsustainable in a finite universe. Koonin is an advocate of the belief that the interconnected system of translation and replication appeared by chance and became the turning point from which biological evolution began. The corollary of the hypothesis is that the RNA world, as a diverse population of replicating RNA molecules, may never have existed. In the proposed model, natural selection would rarely appear in the infinite universe (Koonin, 2007a). The reviewer of Koonin's publication, Eric Bapteste (from Université Pierre et Marie Curie), leads the author by polemic to the following confession:

> "Let us be clear: not a single term in this paper is used in any specific philosophical meaning. The cosmological models and concepts discussed here are physics not metaphysics, even as they have important philosophical implications" (Koonin, 2007a).

Bapteste also pointed out the weaknesses of the theory that open the way for creationists to discuss. He for example stated that:

> "Koonin ends up multiplying the universes to solve a biological issue, when I remember how much, on other occasions, he enjoys to invoke parsimony (the assumption that one should not multiply beings without necessity). I would be more satisfied however when he would have made his own views on ID and the anthropic principle clearer in a revised version of this manuscript" (Koonin, 2007a).

It seems that physicalists like Koonin are doomed to be associated with creationists.

Tomonori Totani (2020), ignoring the philosophical context of biogenesis, made use of the mentioned earlier, cosmologically based theory of Eugene V. Koonin (2007a; 2007b). He must have read the review quoted above and interpreted the criticism in favor of Koonin. Readers may assume so, because he did not refer to them in his article.

Here is an example of the partisans discussed by Uroboros in "In venenoso Dracone ...". Totani, supported by Koonin's theory, set out to show

that origins of life are a matter of making correct calculations. What is unlikely from a terrestrial perspective, gains significance on a cosmic scale. In the summary of probabilistic calculations, he stated that in the light of the adopted concept (and its consequences) the probability of finding biosignatures from planets or satellites in the solar system or exoplanets is negligible. The works of Koonin and Totani are reminiscent of the labour "god of gaps" does.

Interestingly, as indicated by his publications and recorded public appearances in 2022 and 2023, Koonin is currently developing a theory that applies the concept of learning to physically renormalizable systems. He participated in trials of formulating necessary and sufficient principles of evolution to make the universe observable (Vanchurin et al., 2022, p. 1). Learning and selection are viewed from this perspective as analogons, bacause both are understood as optimization processes. (Vanchurin et al., 2022). With colleagues Koonin wrote:

> "The conceptual model of the origin of life implied by our learning-based theoretical framework appears to be fully compatible with Gánti's chemoton, a model of protocell emergence and evolution based on autocatalytic reaction networks" (Vanchurin et al., 2022, p. 11).

Therefore, Koonin now officially directs his well-established research experience towards more contextually relevant works. For instance, one of the focuses mentioned in the article is to exclude certain fictional forms of life, such as Stanisław Lem's famous Solaris (hopefully as well as concepts that he had earnestly considered until recently).

6. THE FIFTH AND SIXTH MYTH: THE BEST ADVOCATES OF BIOLOGY ARE THE BIOLOGISTS THEMSELVES, THE BEST PHILOSOPHERS OF BIOLOGY ARE PHILOSOPHERS

Sometimes it is not biologists who advocate biology best. Austrian physicist Erwin Schrödinger in the book *What Is Life?* (1944), like Ilya Prigogine, inspired a generation of physicists to address biological issues.

By narrowing down the subject matter outlined in the myths referenced by Uroboros to the field of protobiology, I assert that individual with non-biological background can be counted among the most inspiring protobiologists. Such a person is the previously mentioned Smith. In an interview (Smith, 2020) but also in a co-authored book (written with Harold J. Morowitz (2016)) he criticized the object language of the biological sciences. The essentialist concept, which he attributed to Aristotle, had made an impact on language and influenced the perception of the phenomenon of life for hundreds of years.

Since Aristotle's times the organism was considered to be a fundamental object, an individual and subset of space-time in which change of living order happened. According to Smith, there is a need to stop using the object language and start talking about relations as biological entities. He believes that patterns in biology can have the status of an individual in a metaphysical sense. According to him, it is ecosystems that have essential features individuals lack. They should be the fundamental units because they carry the universality of metabolism so closely related to geochemistry. The form of a cell can change, as genes, chromosomes, and species do. In this sense, the invariants are the point of reference, they support the ecosystem. A pattern in biology is a legitimate candidate for the role of a biological entity, even if it consists of dynamically preserved relations, and no object by itself is a carrier of these relations. The scientist reports a need for a theoretical language that would grant self-perpetuating patterns the status of Aristotle's essence. Since the end of the 40's of the 20th century, when the so-called Modern Synthesis occurred, it is assumed that one genetic mechanism is responsible for mutations. Smith distinguished two kinds of "single solutions" to a biological problem: the first are the aforementioned invariants, single because they are the only ones that work and are irreplaceable. Examples of these are the citric acid cycle and amino acids. The second category includes solutions resulting from having a common ancestor, and this is where all "frozen" or "happy accidents" are located. Living matter consists of processes maintained in a state of coordination and patterns (Smith, Morowitz, 2016, pp. 10–11). Adopting the view that both relations and the ordered state of processes are fundamental to the nature of life makes the perception of life as a collection of organisms inadequate. Smith sees the phrase "living things" as a category error. For him, life is not an intrinsic property of things, he perceives the biosphere through the categories of relations and processes, not components (Smith, Morowitz, 2016, p. 11). The question is why the authors seemed so confident in suggesting the need to change the language of biology. In 2004 they analysed with colleagues (Morowitz et al.) the diagram of intermediary metabolism of reducing chemoautotrophs. The reductive citric acid cycle has turned out to be a necessary core of it. This was an achievement that could assure them that they were on the right, although more difficult beginning of the path to explaining the origins of life. The language of protobiology is indeed permeated with the perspective and thinking in terms of RNA worlds.

7. THE SEVENTH MYTH: THERE IS ONLY ONE PHILOSOPHY OF BIOLOGY

It was supposed to be a philosophy of positivist provenance. Inequalities in representing theories formulated on the basis of different worldviews, often conveyed in languages other than English, are visible for example in reports of the current disciplines' states. Anyone who doubts the correctness of this observation can find out for himself through analysis of bibliographies in works published by widely respected publishing houses. Leaving aside the issue of contemporary *lingua franca*, I would like to draw attention to the words of Koichiro Matsuno. He emphasized the importance of natural languages in the development of science. The competence of natural languages to describe evolutionary processes in general, and of the physical origin of life in particular, lies in their ability to accept internal descriptive factors, since natural languages are based on dialogues and not on monologues.

To say that the question of origin goes beyond any scientific discourse because of genuine externality may be one of the possibilities. But such words can be interpreted as just an intellectual dodge. Another prospect, however, would be to shift the descriptive means from formal or scientific to natural language (Matsuno, 1998, p. 303).

Brazilian biologists Leonardo Augusto Luvison Araújo and Claudio Ricardo Martins dos Reis note that biological evolution is often considered the central and unifying axis of biology. However, already in the years 1960-1980 there was a crisis of this way of perceiving it. Despite new proposals for the synthesis of knowledge, contemporary evolutionary biology is characterized by pluralism (Luvison Araújo, Martins dos Reis, 2021, p. 1). Philosophical differentiation suits many biological theories, but this is partly elusive due to the pretence of scientific neutrality. Scientists are not bound by the traditional 20th-century philosophical vision of the unity of science. After all, unification is not an end in itself from the point of view of evolutionary pluralists (Luvison Araújo, Martins dos Reis, 2021, p. 16).

8. CONCLUSION

Although the philosophical landscape of the biological sciences has changed since 1991, there are often remnants of the strong influence of positivist myths. Steps are being taken more and more courageously to counteract them, but the blind extermination of old errors may give us old mistakes in new clothes. Positivist myths are partially recognised in life sciences.

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