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**Is metaphysics a four-letter word and why is it relevant to origin-of-life research?**

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It is common knowledge that putting forward empirical hypotheses open to proof or disproof is at the core of science. I shall argue today that hypotheses not open to proof and disproof are also necessary for science. The belief that life emerged and evolved on earth by natural means is such a hypothesis. It is a metaphysical presupposition.

So what is metaphysics? The answers are many and varied, but put simply, for hundreds of years, philosophers and theologians believed that human reason, endowed by God, can reveal what lies "meta physis" - "beyond physics" or "beyond nature". Reason, not based on experience, was believed to be able to gain certain knowledge, for example on the existence of God and divine design.

Such metaphysical belief is still alive and well today but among scientists, knowledge not based on experience sounds absurd. So why should we devote our time and attention to such an outdated subject? I shall argue that the study of nature *does* rely on metaphysical ideas not open to proof or disproof. However, while traditional metaphysics claimed to provide absolute knowledge of reality, my use of metaphysics is different. I insist on the need for general metaphysical presuppositions guiding our observation and experience.

What I have in mind are not hypotheses put to the test and substantiated or rejected empirically. I am talking, for example, about the belief that no purposeful supernatural force was required for the emergence and evolution of life. Such presuppositions or beliefs cannot be verified empirically and yet, explicitly, or more often implicitly, they constitute the guiding framework that makes the natural sciences possible. The logic of my argument will become clearer when I'll point to the historical development of this naturalistic belief or naturalistic worldview.

First, I have to refer shortly to the philosophical source of this transformed view of metaphysics. Not surprisingly it was raised following the rise of modern science. Toward the end of the 18th century, the German philosopher Immanuel Kant not only denied the validity of traditional metaphysical claims. Kant also contended that the status of metaphysical ideas had to be changed in order to explain how science gains valid knowledge of nature. For example, Kant insisted that the belief that God has designed and imposed laws on nature cannot constitute knowledge. However, he argued that the metaphysical regulative presupposition that nature is a lawful, classifiable system, and not chaotic in its details, is necessary for scientific study. Without it, we could not have formulated empirical generalizations that give rise to empirical concepts and empirical laws.

Kant's so to speak "regulative metaphysics" is still relevant today first and foremost in helping us to distinguish between testable and untestable aspects of science. I'll try to show that only by acknowledging that science includes these two aspects is it possible to defend the unique status of science against its adversaries, especially the new creationists.

It is not a happy piece of news but the influence of the Intelligent Design (ID) movement on prominent intellectuals in the US and Europe, especially in the humanities and the social sciences, is a fact to be acknowledged. Papers and books against Darwinism and naturalism and for the introduction of purpose into nature are published by well-known figures in academia.

I argue that the success of the creationist assault in confusing non theistic intellectuals stems to a large extent from a philosophical weakness within the science camp. The bon ton today is to see science exclusively in a positivistic light, as a fact-gathering and fact-testing enterprise and to ignore the role of any element of worldview and philosophy. This is not how the ID promoters view science. They attack the study of the origin and evolution of life not only for lacking sound empirical grounds but also for being based on the dogma of naturalism (Johnson 1993, Darwin on Trial, p. 158). Naturalistic assumptions, they say, are as much a matter of faith as those of "creation science" (Meyer, S. C. 1985, Scientific Tenets of Faith. Journal of the American Scientific Affiliation, 38(1), 40-42).

In order to defend the theory of evolution against these accusations philosophers of biology argue that science is "pure" of metaphysics (Pennock, R. T. 2011, Can't philosophers tell the difference between science and religion? Synthese, 177-206, p. 187). Scientists, they say, do not rely on "faith" but on methodological naturalism which is "a working hypothesis". (Pennock, R. T. DNA by Design?. 2004, In W. A. Dembski and M. Ruse (eds) Debating Design: From Darwin to DNA, 130-148, p. 134).

Before continuing with my argument let me ask you to consider whether the presupposition that life emerged naturally is today a "working hypothesis" put to empirical test? Is such a presupposition comparable to the working hypothesis that life emerged as a metabolic cycle or as a genetic molecule? Is the presupposition of the natural emergence of life similar to the working hypothesis that life emerged under high temperatures and pressures?

Philosophers of biology, wishing to emphasize the metaphysical neutrality of Darwinism, point out that "Darwinism does not tell us that God is impossible, but only that God is not necessary" (Pennock, 2004, p. 138). This is very true. It is impossible to show the impossibility of God. However, in telling us that God is not necessary Darwinism is anything but metaphysically neutral. For centuries, God was considered by most naturalists necessary for an explanation of biological phenomena. In providing a convincing and working alternative explanation Darwinism was crucial in the historical change from understanding life in the framework of theistic metaphysics to the establishment of a naturalistic worldview.

What is missing from the views of many scientists and philosophers of biology is indeed a historical perspective. I argue that the **naturalistic presuppositions underlying the study of nature** on the one hand and **the theoretical and empirical results of this study** on the other **grew historically by interacting with each other. The more successful empirical science became, the stronger the naturalistic conception grew.**

To substantiate my historical argument will require a longer talk. I will only mention **as an illustration an interesting turn of events which embodies in a nutshell the dynamic interaction between the metaphysical and the empirical aspects of science.**

During the trip on the Beagle, in his investigations on the Galapagos Islands, the young Darwin did not mark the names of the specific islands from which he picked his various finches specimens. As acknowledged in his Autobiography, apart from being sloppy, he still believed in the thesis of the separate creation of species and could not believe that islands so close to each other with such similar climates could give rise to different species. **At the same time, Darwin was already beginning to have what he called "his doubts on the question of species".** Then, on the way back to England, the Beagle stopped in South Africa and Darwin met and had a crucial discussion with his intellectual hero, the astronomer John Herschel. Under Herschel's influence Darwin adopted a sort of methodological naturalism, rejecting miracles and the ideas suggested by geologists and naturalists about recurring creation of new species. Back in London, **the rich material brought by Darwin from his trip was analyzed by expert ornithologists (especially John Gould) who determined that quite a few new, distinct species of the same genus of birds populated the different islands. Only then** did Darwin go all the way**. Based on these data** he accepted the fact of the "unlimited transmutation of species" (Sulloway F. J. 1982, Darwin's Conversion: The Beagle Voyage and its Aftermath. J. of the History of Biology, 15(3), 325-396, p.369**).** Only then did he embark on a new metaphysical path. He was led to look for a natural, material explanation for evolution and adaptation(Kohn, D. 1989, Darwin's Ambiguity: The Secularization of Biological Meaning. British J. for the History of Science, 22, 215-239, p. 228).

The dynamic interplay demonstrated here in Darwin's development of a new metaphysical conception can be traced in the long historical development, first of the physical sciences, especially since the scientific revolution, and later of the biological sciences.

How can my argument contribute to the ongoing debate with the adversaries of science? I mentioned that there is a notable tendency among non-theistic intellectuals to be swayed by the new creationists. They are mostly convinced by the ID claim that there is symmetry between naturalistic assumptions and religious belief. Following this claim, the prominent and highly respected NY University philosopher Thomas Nagel, said that ID and Darwinism are symmetrical positions: "Either both of them are science or neither of them is" (Nagel, T. 2008, Public Education and Intelligent Design, Philosophy and Public Affairs, 36(2), 187-205, pp. 200-201.) Agreeing with a famous Notre Dame University who promotes the ID movement, Nagel, a self-described atheist concluded that "the result [of the conflict between science and religion] is a standoff: whether theists or atheists are right depends on facts about reality that neither of them can prove" (NY Review of Books, Nov 8, 2012, p. 74). [ Nagel's recent book, Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature is Almost Certainly False, Oxford University Press, came out in 2012. Also, in 2009, Nagel recommended a book by Stephen Meyer, a leader of the ID movement to the list of the Top Books of the Year published by the TLS. The book is called, Signature in the Cell: DNA and the Evidence for Intelligent Design. ]

I believe that the common reactions by many defenders of science that "science is neutral" or "pure of metaphysics" are untrue and won't work. Science **is based** on presuppositions not open to empirical testing. However, and here is the crucial difference between theistic and naturalistic metaphysics – **Religious belief is based on revelation, interpretation of scripture and, in general, supernatural assumptions. Naturalistic belief-system or naturalistic metaphysics, on the other hand, has developed historically, to a large extent, on the basis of the empirical work of science and its achievements.**

**The notion that life emerged naturally is not a "working hypothesis" anymore. This conviction is a fundamental aspect of a robust worldview drawing its strength from the historical record of science.**

**Conclusion:**

* **There is an element of “faith” in modern science.**
* **This is the presupposition that natural phenomena are based on material mechanisms and not on intentional design.**
* **It is not a “working hypothesis” open to empirical proof or disproof.**
* **The historical interaction between this “faith” and the theoretical and empirical achievements of science led to the development of a well-established naturalistic worldview.**