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Sadržaj

On the concept of design as a very general idea in philosophy of science

Tonći Kokić

I. SCHEME

An article of this size can study only a thin layer of the topic of scientific legitimacy of design in general, and concerning OoL (Origin of Life, the shorthand 'OoL' will be used throughout the paper) in particular. This article is an abstract (meta)theoretical study which does not deal with the details of the design problem nor with the current research in the area of OoL. Instead, it is concerned with the concept of design and with general metaphysical (and epistemological) beliefs about the nature of the world, as well as about OoL, which are not in the foreground. These metaphysical beliefs are then transformed into the methodological commitments for any scientific inquiry, complementary with classical requests for scientific theories or hypotheses – explanation and theoretical entrenchment of some kind and degree of predictability and testability – all of which is achieved through empirical observation and experiment. To clarify this, the second section of the essay argues that design is loosely defined, if at all, and it presents a few attempts at its definition, connected with observation of processes that run counter to natural ones, as well as possible ways of recognizing design activity in nature. Because the concept of design is banned, or at least under suspicion as being scientifically illegitimate, the third section discusses two analogies, thereby hoping to comprehend an obvious or camouflaged metaphysical stratum of thought which is frequently presented as a pure scientific matter of fact. These analogies attempt to clarify the scientific legitimacy of other logically (and nomically) possible explanations. The fourth and the fifth sections investigate the logical permissibility of metaphysical assumptions (in the fourth) and epistemological assumptions

of designer activity (in the fifth). Based on this investigation, the sixth section conjectures that design cannot be excluded as a source of first life on both metaphysical and epistemological grounds and it proposes that *the concept of design could have scientific legitimacy as a very general idea inside a conceptual hierarchy of science*, similar to many other metaphysical concepts, such as uniformity, predictability, scientific laws and the intelligibility of the universe. Finally, this makes it reasonable to conclude that, under some interpretations of philosophy of science, the scientific legitimacy of design could be reconsidered.

II. ON THE CONCEPT OF DESIGN

The concept of design generally, and in the case of OoL research, is not a serious option in scientific explanations; more precisely, the concept of supernatural design is entirely prohibited. To put it mildly, non-intentional explanations are to be preferred before all others. This default metaphysical position seriously emerged in the appearance of Darwin's theory of evolution by which the concept of design was removed as needless, because there is ... "no need for the God hypothesis".[1] This assumption was later transformed in the widespread and loose definition of naturalism according to which reality is exhausted by nature and does not contain anything 'supernatural'. Naturalism becomes a fundamental metaphysical (ontological) and epistemological position which serves as a signpost intended to be a methodological obligation for all further scientific reasoning. Recently, design has been viewed exclusively from the perspective of the Intelligent Design (ID) movement. Philosophical dictionaries and encyclopaedias do not have a heading on the concept of design but direct towards Argument from Design,[2] Teleological Arguments for God's Existence[3] and Design Arguments for the Existence

[1] Francisco Ayala and Robert Arp, "Is There a Place for Intelligent Design in the Philosophy of Biology?", in: Francisco Ayala and Robert Arp (ed.), *Contemporary Debates in Philosophy of Biology*, Blackwell Publishing Ltd., Malden, MA, 2009, p. 338 [337–340].

[2] Robert Audi (ed.), *The Cambridge Dictionary of Philosophy*, Cambridge University Press, Cambridge 1999, p. 227.

[3] Edward Zalta (ed.), *Stanford Encyclopedia of Philosophy*, Stanford, The Metaphysics

of God and Intelligent Design.[4] Elsewhere in the literature it is possible to find more design definitions focusing on the logical relation of contraries: Dembski's definition relies on the negation of regularity and chance,[5] Behe defines (intelligent) design by irreducible complexity at the molecular level,[6] and Davies sees design as a product of some kind of 'cosmic computer'.[7] On the contrary, there is an opinion that design (in biology) means "first, that organisms evince to have been designed; ...second, that only God could account for the design".[8] Ayala also thinks that Intelligent Design is more of a political movement than a 'theory' or hypothesis which can be subjected "to critical examination and empirical testing" and which avoids references to God "so that the 'theory' of ID can be taught in the public schools as an alternative to the theory of evolution".[9] So, Ayala rejects design as a legitimate part of science. A trivial definition of design determines design as a noticeable and easily understandable action of a supernatural designer by intervention which opposes natural processes. As well, there is a definition of design as an intentionally produced order or set of patterns, which are mind correlative and which must include some kind of counterflow.[10] Counterflow means that observed things are "running contrary to what, in the relevant sense, *would* (or *might*) have resulted or occurred *had* nature operated freely".[11] In this case, the designer does not have to be

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Research Lab Center for the Study of Language and Information Stanford University, 2017, https://plato.stanford.edu/ (24.3.2020.).

[4] Dowden Bradley (ed.), *Internet Encyclopedia of Philosophy*, ISSN 2161-0002, https://www.iep.utm.edu/ (24.3.2020).

[5] William Dembski, *The Design Inference: Eliminating Chance through Small Probabilities*, Cambridge University Press, New York, 1998, p. 36.

[6] Michael Behe, *Darwin's Black Box*, Free Press, New York, 1996, p. 257.

[7] Paul Davies, *The Mind of God. The Scientific Basis for a Rational World*, Simon & Shuster Paperbacks, New York, 1996, p. 97, 123, 124.

[8] Francisco Ayala, "There is No Place for Intelligent Design in the Philosophy of Biology: Intelligent Design Is Not Science.", in Francisco Ayala & Robert Arp (ed.), *Contemporary Debates in Philosophy of Biology*, Blackwell Publishing Ltd., Malden, MA, 2009, p. 364 [364–391].

[9] Ayala, "There is No Place for Intelligent Design in the Philosophy of Biology"...p. 375, 365.

[10] Del Ratzsch, *Nature, Design and Science. The status of Design in Natural Science.* SUNY Series in Philosophy of Biology, New York, 2001, p. 4, 5.

[11] Ratzsch, *Nature, Design and Science*...p. 5.

supernatural – although that option is not excluded, it does not have to act opposite to nature but in ways nature is seldom working, its actions can be part of natural laws or in acts that preceded natural laws or is a fuzzy quantum processes which cannot be explained by known laws. Also, its action could be epistemologically inaccessible to humanity. All these different definitions of design would probably agree with one fact: proof of design or an intentional agent should indicate that at least some marks of observed phenomena are not natural: repetitious macroscopic patterns,[12] symmetry, geometric characteristics and other types of patterns in mesocosmos[13] and/or the presence of some type of counterflow. There are also 'secondary' marks of agent activity and counterflow which are "typically appealed to in traditional design arguments – complicated development, complex structures, coordination of components, adjustment of means to ends, interlocking functions, extreme improbability, purpose like behaviours etc.".[14] Also, in order for a scientific theory or hypothesis to be considered scientifically legitimate, and to be one that provides evidence of intentional doing and/or counterflow, it is necessary to complete standard requirements of "(a) testability and falsifiability through empirical observation and experiment, as well as (b) results, predictions, and explanations".[15]

III. TWO ANALOGIES

There is a strong aversion to considering design as legitimate scientific concept, based on the belief that design could not satisfy the standard requests for scientific theories or hypotheses. The two analogies discussed below, representing two broad metaphysical positions (one which allow only mind-independent world, and one which does not restrict world on that way), may be helpful in revealing the metaphysical (or methodological) stratum of thought instead of a pure scientific matter of fact.

[12] Jacques Monod, *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology*, Vintage Books, New York, 1972, p. 11, 81, 120.

[13] Ratzsch, *Nature, Design and Science*...p. 12.

[14] Ratzsch, *Nature, Design and Science*...p. 12.

[15] Ayala and Arp, "Is There a Place for Intelligent Design in the Philosophy of Biology?"...p. 339.

Also, these analogies could elucidate the scientific legitimacy of other logically (and nomically) possible explanations and compare their status with regard to the abovementioned requests for scientific validity.

1.1 Space Odyssey Monoliths

There are different definitions and interpretations of black monoliths that appear in the book and movie *2001: A Space Odyssey* and other novels and movies from the same series.[16] Putting aside complexity of meaning and numerous interpretations which are not significant here, it is possible to say that extremely flat solid black monoliths observed in a three dimensional Euclidean space have the shape of a rectangular cuboid whose sides extend in a ratio of 1x4x9 (and probably the ratio of proportions continued in a similar ratio in additional dimensions up to an unknown size to humans). Monoliths are as large as necessary. The human observer has limited knowledge of the composition, internal structure and functions of monoliths because they are almost indestructible and impenetrable,[17] resisting deeper analyses. But, at least for the monolith TMA-2,[18] there is evidence for mass and density (net greater than of air), with the possibility to teleport and replicate itself, as well as the possibility of its copies to assemble themselves into a bigger structure capable of performing tasks not achievable by a single unit (emergent properties). The monoliths are directed by some kind of internal program and the consciousness of human and artificial intelligence could be incorporated as computer programs into its software. Monoliths communicate within some sort of hierarchical organization of lower and higher monoliths in accordance to an authorization for decision making. This interaction has some characteristics of 'sociability' and work division. Among some monoliths it is possible to notice magnetic fields (for example, TMA-1), the broadcasting of radio waves

[16] 2010: Odyssey Two (novel and movie), 2061: Odyssey Three (novel), 3001: The Final Odyssey
(novel).

[17] Except the structurally destructible TMA-4, and the functionally destructible monolith TMA-2.

[18] The abbreviation TMA-2 stands for Tycho Magnetic Anomaly and the serial number of observed monolith.

and an autonomous supply of electric power from a huge energy-storage system of cosmic superconductors. At least the function of one monolith (TMA-0) appears to be conjoined with the increase in speed of human evolution, but without any proved causal relation. In the series *A Space Odyssey* human observers conclude:

(i) Monoliths are artificially produced by operation of intentional (finite) rational agent or agency.

Explanation of (i): although the composition, structure and operation of monoliths are known only superficially – flat surface, geometric shape and ratio of the sides (1x4x9) which is the squares of the first three positive integers, they indicate intentionally produced patterns which correlate to rationality, as well as a functional bias to purpose. This solution includes some kind of counterflow. Counterflow should be part of the explanation of the origin of monoliths because nature does not make cuboids (especially not with that side-ratio) and the monolith's functions make it difficult not to believe that we are dealing with some kind of intentional agency.

Still, some other logically (and nomically) possible inferences and explanations are available:

(ii) Monoliths are naturally produced by chance process.

Explanation of (ii): The degree of probability of the chance origin of the monoliths with their observed structure and functions seems to be too low to be treated as a serious option[19] – it is nearly impossible – virtually zero, yet, because of this, this option cannot be logically (and nomically) excluded. In fact, in OoL research such highly improbable events could be commonplace.[20] Counterflow is not part of the explanation. The structure and functions of monoliths look purposeful, but that is only an epiphenomenon of underlying physical components, processes and natural laws.

[19] As Hoyle's well-known chance argument which challenges the probability of abiogenesis by comparing the chance that a tornado sweeping through a junkyard might assemble a Boeing 747 plane.

[20] Christian De Duve, *Vital Dust*, Basic Books, New York, 1995., p. 112; Robert White, "Does Origins of Life Research Rest on a Mistake", *Noûs*, 2007, 4, [453–477].

(iii) Monoliths are naturally produced by necessary and inevitable determined processes.

Explanation of (iii): This option assumes that monoliths appear as an inevitable or at least highly expected result of certain prior physical and/or some other initial conditions and laws somewhere in the 'past'. So to speak, the monoliths are the outcomes of some brute physical constraints and conditions; purposeful intentional activity or happy accident are excluded.

(iv) Monoliths are naturally produced by a long-lasting process of millions of small intermediate steps governed by some kind of evolutionary principle, but for sure they are the natural consequence of a specific physical (and chemical) organization of matter and natural laws.

Explanation of (iv): This explanation considers the low probability of the sudden appearance of the monoliths' structure and functions and excludes design as explanation, and considers the occurrence of long-term natural processes consisting of a large number of small steps in which available material was moulded by existing natural laws and principles as a more probable explanation. All of this has happened as the natural consequence of a specific physical self-organization of matter – for instance crystals, by some kind of evolution of physical components, and laws which have finally shaped matter into the monolith form. As in the two above explanations, counterflow or purposeful activity are not observed and the final product is the pure consequence of natural forces.

All explanations (i) – (iv) acknowledge some semblance of purposeful activity in the monoliths' functions and presumed structure. But, while hypothesis (i) claims obvious counterflow (nature was somehow disturbed or projected) and purposeful activity as a mechanism that enables the monoliths' machines to maintain their systems and perform certain functions and tasks, as something consciously planned by an intentional (finite) agent, so far hypotheses (ii) – (iv) do not accept counterflow and reject purposeful activity as the deliberate anticipation of some rational agent – a purely natural mechanism must be responsible for the semblance of 'goal-directed' processes in the monoliths. All explanations (i) – (iv) equally fail to fulfil previously mentioned re-

quests for testability and falsifiability through empirical observation and experiment,[21] so, we cannot decide based on that.

1.2 The Astronauts

Let's imagine for a moment that the monoliths are a lure intended for the investigation of desirable objects. In this way Dr. Heywood R. Floyd and his associates in Moon base Clavius are investigated: data shows they are 'machines' made of just a few basic chemical components (CHON),[22] but their energetic mechanisms differ from the energy flow in the rest of universe, specifically related to heat work and energy, meaning that the system of these machines is not in thermal equilibrium, which allows for mechanical work. This means that the asymmetric process of heat transfer, which cannot be converted entirely into work, degrades toward an equilibrium state in which, finally, no energy is available to do 'useful' work. This situation is named entropy or the degree of disorder of the system. These machines, similarly to monoliths, take negative entropy[23] or free energy from the environment for their work and order, while increasing disorder in the universe. Furthermore, in the chemical sense these are highly integrated cybernetic systems with the complex 'command' management and control of chemical activities, with the ability to create stable, diverse, large and complex molecules. It appears that these machines, in the structural sense, have a hierarchical order in which every higher level is based on all the intact lower levels and each higher level provides some new properties not found on any lower level.[24] Physical constants, components and laws of nature are necessary for the origin of life, maybe even fine-tuned for it,[25] but

[21] Ayala and Arp, "Is There a Place for Intelligent Design in the Philosophy of Biology?"...p. 339.

[22] 99.9% of the biochemical content of living organisms includes just four elements: carbon, hydrogen, oxygen and nitrogen (C, H, O i N), and in total just 25 chemical elements.

[23] Erwin Schrödinger, *What is Life. The Physical Aspect of the Living Cell*, Cambridge University Press, Cambridge, 2013. The book was first time published in 1944.

[24] The following levels are noted: subatomic, atomic, molecule, macromolecule, organelle, cell, tissue, organ, organ system and organism, but some other higher and unknown levels of organization are possible.

[25] The list of fine-tuned parameters is extensive: from cosmic constants, initial con-

are still not sufficient to explain it. A large number of these machine parts are in an enormously complex relationship between substance and energy modification (metabolic and catabolic reactions), which is not spontaneous and involves things like *homochirality*, whose origin is mysterious, or at least unknown.[26] Considering replication, investigated machines contain something like 100 trillion cells per unit, with a total of three billion bases in (DNA) molecules. Micro machines found inside them (*E. coli*) can replicate their entire genome of roughly 5 million bp in time approximating to 40 minutes. The requested clue here was to find some fundamental physical law or principle in the foundations of gene replication or gene expressions, as well as the origin of coded information for the machinery of protein production. The knowledge of the underlying physical principle of gene replication and the origin of this coded system remains unavailable. These machines have a 'control unit' made of one hundred billion[27] components (neurons), where each neuron can make contact with thousands or even tens of thousands of other neurons, via synapses, and they make a million new connections during every second of its function. And finally, these machines possess subjective consciousness – *qualia*, language, they can think in general concepts and grasp meaning. Other numerous important properties could not be listed here.

Hypothesis and explanation of the origin of these 'machines', as made by the monoliths, are as follows:

(v) These machines are produced by deliberate rational agent activity or a designer.

Explanation of (v): Conditions favourable to the (life) origin of these machines on Earth are registered, they are necessary but not sufficient for 'building' it, as well. No laws of nature that directed or instructed matter to produce these machines are observed, therefore it is reasonable to conclude that nature was disturbed at least to a degree of nomic

ditions and local planetary conditions to their fundamental effects for the origin of life as the polarity of the molecule of water.

[26] David Deamer, *First Life. Discovering the Connections Between Stars, Cells and How Life Began*, University of California Press, Berkeley, 2011, p. 79.

[27] One followed by 11 zeros.

discontinuity – or even less – to a level where the origin of this machine just circumvented the laws of nature. So, counterflow could be implied. The decisive element in this inference is the extraordinary complexity of parts and their interconnections, as well as adapting the organization of means to an end unrecorded outside of this kind of machines. All of this correlates to rationality.

However, some other inferences and explanations are logically (and nomically) available:

(vi) Machines are naturally produced by chance process.

Explanation of (vi): The degree of probability of the chance origin of the amazing complexity of the arrangements which are needed to produce these machines is close to zero – virtually zero. The proofs show that these machines originated very quickly, in some kind of burst mode, immediately upon the creation of the conditions for it on Earth.[28] It is too short a time to do the job of assembling functionally and structurally complex, as well as mutually dependent and interlocked, parts. This obstacle could be hardly resolved without the introduction of some kind of counterflow as a trigger which puts 'system at work'.

(vii) Machines are produced naturally by a necessary and inevitably determined process.

Explanation of (vii): According to this hypothesis the appearance of machines is inevitable and highly expected as the result of certain prior physical conditions, some other initial-primordial conditions and deep underlying laws and constants. Machines are the outcomes of some brute physical and/or chemical constraints. The appearance of machines is expected, or at least not surprising. Counterflow could be part of the explanation and purposeful intentional activity cannot be excluded, albeit both are not directly accessible to the observer.

[28] Iris Fry, *The Emergence of Life on Earth: a Historical and Scientific Overview*, Rutgers University Press, New Brunswick, 2000, p. 125.

James Griesemer, "Origins of Life Studies", in: Michael Ruse (ed.), *The Oxford Handbook of Philosophy of Biology*, Oxford University Press, New York, 2008, p. 271 [263–290].

(viii) Machines are the result of a long-lasting process of millions of small intermediate steps governed by some kind of self-assembling principle, they are the natural consequence of a specific physical organization of matter and natural laws. Anyway, agent activity could not be excluded because of the impossibility of direct access to evidence.

Explanation of (viii): This hypothesis presupposes that the origin of these machines more likely was a long-term process consisting of a large number of small steps in which available material was moulded by natural laws and principles – or a mechanism which still has to be functional now.[29] Counterflow or purposeful activity is not obvious, but the impact of some kind of agency could not be excluded from the area of initial conditions and processes –nomic discontinuity is at least possible, there exists a process on a deeper level which does not include any kind of even mild nomic violations.

Only hypothesis and explanation (v) explicitly includes counterflow and/or purposeful activity as part of its explanation. On the other hand, hypotheses (vi)–(viii) do not include but neither do they reject counterflow and they do not exclude the possibility of the purposeful activity of an intentional agent as a designer of these machines. Either way, similarly to the previous analogy, explanations (v)–(viii) equally fail to fulfil the requirement of testability and falsifiability through empirical observation and experiment, which prevents us from deciding based on this kind of postulate.

IV. ON METAPHYSICS

Human observers conclude that the monoliths were built by an unseen and unknown extra-terrestrial species, but still, their conclusion features the credentials of scientific legitimacy: it does not matter that information about the structure and functions of the monoliths are strictly limited and a designer is unobserved. An unobserved designer is not a cause for a proclamation of the scientific illegitimacy of the design

[29] David Penny, "An Interpretative Review of the Origin of Life Research", *Biology and Philosophy*, 2005, 20, p. 640 [633–671].

hypothesis, even scientific realism does not reject both unobservable and unobservable *per se* phenomena as unscientific. The problem could be found in some interpretation of scientific realism as "true or approximately true descriptions of observable and unobservable aspects of a mind-independent world"[30] because there is no proof of the monoliths' nature – mind correlate. Likewise, it is not problematic if a conclusion is not based on empirical data from the origin of monoliths. Further, it could be mentioned that the scientific legitimacy of theories is not just derived from empirical data: Popper mentioned the example of astrology or psychoanalysis which relies on a staggering amount of empirical evidence based on observation – horoscopes and biographies. Also, this type of theories needs additional assumptions to explain its phenomena:

> ... requires revisions and added ad hoc assumptions to be able to explain ... The ad hoc theory (in psychoanalysis, AN): is based on a mixture of theory and private language seasoned with a sprinkling of body wisdom, some vague memories of clinical moments, and perhaps a mixture of other sensations aroused by the ambience of the consulting room .... [31]

In our case, an observer's inference is reached on the basis of a mix of metaphysical assumptions, ad hoc hypotheses and speculations derived from deficient empirical evidence. In fact, it seems the conclusion is reached more on the conviction that hypotheses (ii)–(iv) are unacceptable than on any positive evidence for hypothesis (i). But, those who argue against the scientific legitimacy of the concept of design in philosophy of biology claim, as Ayala does, that "It is not sufficient for a theory to be accepted because some alternative theory has failed".[32] Moreover, there is no security in the failure of hypotheses (ii)–(iv) nor does hypothesis (i) fulfil the necessary conditions of scientific legitimacy: it is not testable, it is not falsifiable by means of empirical observation and experiment, nor does it offer clear predictions. Hypothesis (i) and its explanation are the result of a metaphysical preconception of what might

[30] Anjan Chakravartty, "Scientific Realism", in: Edward N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy* (Summer 2017 Edition), https://plato.stanford.edu/archives/sum2017/entries/scientific-realism (24.3.2020.).

[31] Aviezer Tucker, "Unique events: The Underdetermination of Explanation", *Erkenntnis*, 1998, 48, p. 67 [59–80].

[32] Ayala, "There is No Place for Intelligent Design in the Philosophy of Biology"...p. 375.

be rationally warranted in this case: an observed regularity of patterns and geometry, a uniformity of material, geometric shape (plan surface), a ratio of sides which indicates a correlation to the mind and functions similarly to purposeful activity that does not look like a habitual flow in nature.[33] But, a logically (and nomically) possible origin of such complex entities as monoliths, based on hypotheses (ii)–(iv) which are without counterflow and intentional agent activity, is rejected as an explanation without any (counter) evidence. So, neither hypothesis (i) nor hypotheses (ii)–(iv) can be proved or denied, and acceptance of hypothesis (i) is based on deep metaphysical assumptions about the nature of the universe (including monoliths) and the methodological commitments (methodological materialism or naturalism) we find in science. The flow of the argument is almost the same as the one we find in the so-called argument from design: the observer concludes from the assumption *what nature would not do* to the conclusion of *what the mind would do*. According to this, hypothesis (i) itself has a modest exploratory power (low degree of testability and falsifiability), and the connection between metaphysical and empirical levels is rather weak. Still, human observers undoubtedly believe in the scientific legitimacy of hypothesis (i) and scientific illegitimacy of hypotheses (ii)–(iv).

On the other hand, monoliths receive data showing that machine-humanity has extraordinary structure and functions, and only one of its parts (the cell) has an intricate network of functions which goes beyond any artificial object, and it is possible to say that its brain represents the most complex type of structural-functional entity in the universe. First life was for sure simpler, but nonetheless "the kind of system required for a process of natural selection to get going would also have to be extraordinary intricate and complex".[34] Also, the question is "How can a universe of mindless matter produce beings with intrinsic ends, self-replication capabilities, and 'coded chemistry'".[35] Just because we still do not know how, we cannot laconically and without any proof credit blind forces with this. In what way does the validity of the logical structure of

[33] Comprehensive list of properties suitable for counterflow identification can be found in Ratzsch (2010).

[34] White, "Does Origins of Life Research Rest on a Mistake"...p. 470.

[35] Anthony Flew, *There is a God: How the World's Most Notorious Atheist Changed his Mind*, Harper Collins Publishers, New York, 2007, p. 124.

the argument according to which it is possible to reasonably assume that monoliths are a product of design, and that the most complex entities in the universe – humanity and the human brain – stand unshakable in the belief they must be products of unconscious physical and mechanical unidirectional forces, remain unclear? The main reason for accepting this kind of solution is metaphysical assumption: hypothesis (i) deals with natural design and hypothesis (v) with supernatural. That is, it testifies to the scientific legitimacy of the hypothesis of (neo)panspermia according to which life was sent to Earth by an automatically controlled spacecraft, as Francis Crick proposed.[36] This hypothesis does not explain the OoL, but it moves it to another remote location, and it hardly can be scientifically legitimate.

The key reason for attributing the scientific legitimacy to hypothesis (i) and scientific illegitimacy to hypothesis (v), both of which assume intentional activity, is an assumption of metaphysical materialism or naturalism as part of *background knowledge* – later transformed into a commitment of methodological materialism or naturalism – regarding the existence of solely natural entities in a mind-independent world. Of course, it can be said that natural science deals with its own realm, the realm of natural objects and forces, and that even if not excluded, supernatural entities must be separated into other area, as NOMA (*nonoverlapping magisteria*) posits.[37] NOMA postulates two worlds and two areas of epistemological competence: first, the magisterium of the material, empirical world which recognizes the scientific method as suitable and second, the transcendent ontological magisterium which is not accessible by epistemology of natural science. The NOMA, in principle, does not deny the possible existence of supernatural entities but posits them as epistemologically and methodologically needless in natural science.

There is also possibility of POMA (*partially overlapping magisteria*), a position which assumes the possibility of the permeation of two areas, as proposed by former Head of the Human Genome Project (1994 – 2008) Francis Collins.[38] According to this, the concept of design would

[36] Francis Crick, *What Mad Pursuit*, Penguin Books, New York, 1988, p. 148.

[37] Stephen J. Gould, "Nonoverlapping magisterial", *Natural History*, 1997, 106, 2, p. 4 [16–22].

[38] Francis Collins, *The Language of God: A Scientist Presents Evidence for Belief,* Simon & Schuster UK Ltd., London, 2007.

be acceptable as a metaphysical assumption which is a basis for some concrete scientific theory: field theory was derived from Faraday's belief in God as creator and sustainer of the universe, Maxwell field equations was based on his understanding of interactions among the Trinity.[39] Flew holds similar views and lists a few other famous names who believe the laws of nature mirror the Mind of God: Planck, Heisenberg, Schrödinger, Dirac and even Einstein. So to speak, metaphysical assumptions are at least (i)ndirectly a matter of science: quite different models can give very similar results. The well-known, although fairly crude example, compares Ptolemy's and Copernicus' models of the universe: the first is geocentric and the second heliocentric, and while they have several other differences, both models were capable of predicting planetary positions. Although imprecisely,[40] the two theories did not differ in their predictions regarding the astronomical data. This situation was recognized as the problem of the underdetermination of scientific theory by evidence, claiming that the available evidence may be insufficient to determine what beliefs we should hold appropriate due to that evidence. I think this puts forward the concept of design as at least permissible on the deep metaphysical ground. The next step is checking the situation on the epistemological side of the issue.

V. EPISTEMOLOGY OF THE (SUPER)NATURAL

The epistemological position of hypothesis (i) is straightforward: it is hard to avoid an explanation which includes a touch of counterflow somewhere along the causal chain of events which preceded the origin of the monoliths. Explanatory reasoning in generating hypothesis (i) rests on abduction – inference to the best explanation, as well as justifying it. Although abduction is a kind of inductive argument which is not logically valid, strictly speaking, it seems quite reasonable in this case (as in many other cases we deal with every day). Other explanations

[39] Ratzsch, *Nature, Design and Science*...p. 128.

[40] Copernicus' predictions agreed better with observations of the superior planets and solar eclipses, while Ptolemy's predictions were more accurate for the inferior planets and lunar eclipses. At the end and in total, the Copernicus predictions were superior.

are possible but they do not look rational according to our previous knowledge about the world or according to our best theories about the world: nature does not make cuboids which reproduce themselves and have functions that were described earlier. In either case, hypothesis (i) and hypotheses (ii) – (iv), as the final or ultimate cause of investigated phenomena, belong to the realm of purely natural, beacuse even the presupposed finite designer of the monoliths is a part of nature.

The explanation of hypothesis (v) also included a touch of counterflow somewhere in the causal past of the investigated objects. But it would be hasty to put up hypothesis (v) as a model of an easily observed and knowable direct creation of things by supernatural designer through intervention, contrary to natural and logical laws. This is a pretheoretical (or naive) assumption because it uncritically magnifies human epistemological capability and minimizes the power of a possible supernatural designer.

Considering the first, the human epistemological subject has limited sensory capacities even when the phenotype is extended through different highly developed technical devices and conceptual inventions or theories. Quantum phenomena are an example of this kind: we cannot prove on the quantum level whether nature produced something on its own or did a designer intervene somewhere inside fuzzy quantum processes or initial conditions prior to them. Also, any knowledge of quantum phenomena necessarily includes interactions between quantum phenomena and the observer. In this way, a possible designer intervention on the quantum level could be scientifically inaccessible in principle. The second example is the random nature of mutation processes as one of two basic principles of evolution, but the concept of randomness just means our lack of knowledge about (possible) real causality in that processes. Darwin wrote about variations due to chance as "wholly incorrect expression ... serves to acknowledge plainly our ignorance of the cause of each particular variation".[41] Moreover, at least a few cases proved that mutations are not-random or spontaneous.[42] These cases might belong to the class of so-called *God of the Gaps* cases which do not

[41] Charles Darwin, *The Origins of Species by Means of Natural Selection*. Random House Value Publishing, New York, 1979.

[42] Barbara E. Wright, "A Biochemical Mechanism for Nonrandom Mutations and Evolution", *Journal of Bacteriology*, 2000, 182, 2993–3001.

have a good reputation in regards to their scientific legitimacy, which does not mean that it is possible to ignore them nor that they would be problematic for the acceptance of supernatural design as an explanation. An assumption about the natural inability of producing life is not *per se* scientifically illegitimate: this is not just a rejection of the metaphysical commitment in natural explanations for whatever phenomena but is also a fact recognized by science itself: it is not unscientific to claim *in principle* the inability of things to go faster than light or the absurdity of *perpetuum mobile* constructions. The long-term resistance of OoL to the scientific explanations indicate that it could in principle be epistemologically unattainable, situated above the human ability to understand and explain. For instance, unique events could be epistemologically inaccessible or at least problematic: "It seems that at least in the case of singularities ... there are events beyond the purview of science".[43] So, a statement about the impossibility of a naturalistic explanation of OoL is not scientifically illegitimate but could be metaphysically unacceptable for someone.

Considering the second, this assumption overlooks the potencies of a supernatural designer and that possible design activity does not have to include the violation of natural laws: it could just set up initial conditions (before laws existed or set up these laws at a primordial stage) or it could use natural processes we do not know or understand in a nomic way (it could operate in a probabilistic mode or without causation). Also, the question of why (and how) the universe originated, together with uncertainty about some other possible results of that process (as different universes, with different laws and conditions or even without them – as a disordered universe) remain as one of things which are addressed mostly by the metaphysical realm. In this way, a supernatural designer could set up a universe in such a way that creation could be consistent with natural laws through initial primordial conditions, processes and results, or could set up nomically forbidden conditions out of which life would then purely naturally arise. So, counterflow could be undiscovered on a (pre)historical time scale because designer interven-

[43] Tucker, "Unique events: The Underdetermination of Explanation"... p. 61. In the same publications Tucker offers a comprehensive philosophical debate on problem of unique events and relates issues of definition, underdetermination of explanation, types of unique events etc.

tion stays deeply hidden somewhere in prehistorical or protohistorical time 'when' nature was not completely shaped by the full constants and laws we recognize as active today, as well as time itself. It is very naive to imagine a supernatural designer being forced to leave traces of counter-flow or who designs directly against the lawful natural flow. Due to this, there is a possibility that "design activity operates within the stream of natural laws and process, but laws are neither suspended nor broken".[44] A supernatural designer could have restricted his/her/its intervention on the determination of the primordial conditions in the beginning of the universe without any interference into historical time and processes: by this approach supernatural intervention could be qualified as natural at the level of processes (and result) that led to the origin of first life within time. Due to this, design cannot be excluded as a source of first life at some stage of the (pre)development of universe.

VI. DESIGN CAN BE A LEGITIMATE PART OF SCIENCE

Mainstream science is quite optimistic about the prospect of a scientific explanation of the origin of first life, claiming that the explanation of the origin of life is, albeit difficult, in principle solvable. In addition, there is a widespread belief regarding a giant advance in science reached in this area of research and rapid growth in understanding the key steps in processes that lead to life, which could give a full scientific explanation of the OoL. On the contrary, it seems that the current stage of 'business' is not so promising and convenient results are not available, both in the theoretical and experimental domains. It is possible to speak about weakness of the scientific hypotheses about the OoL because:

> There are significant impediment to the scientific explanation of OoL... (i) there is no scientific hypothesis that successfully explains OoL, and (ii) there is an evident experimental failure of the attempts to (re)create life from inorganic components... the scientific study of OoL rest on a mistake or science must reduce the scope of phenomena that can be scientifically explained.[45]

[44] Ratzsch, *Nature, Design and Science*...p. 30.

[45] Tonći Kokić, "Weakness of the Scientific Hypotheses about the Origin of Life", *Filozofia Nauki*, 2018, 1, p. 9 [9–23].

Instead of a strong scientific theory supported by successful experiments, there are a number of barren hypotheses followed by failed attempts in recreating life. In fact, from the theoretical view of the problem, OoL is still in a pre-paradigmatic phase or an immature science, and from the empirical side of view, the confirmation of these hypotheses indicates only "...tiny steps on the long road to life".[46] So, the devastating fact is that both hypotheses and experiments guided by them lack some (and the most important) components required for full description of the origin of life.[47] Also, it remains unclear whether supernatural design as an explanation in principle is banned in science or if such theories / hypotheses are banned because they are incorrect or wrong, meaning that they do not follow scientific methodology (predictability, experimental verifiability/falsification). It seems reasonable that supernatural design could not be legitimate as a particular scientific theory or hypothesis, but it also seems quite reasonable that it could be legitimate as a metaphysical assumption. The assumption of design can be contained in the general metaphysical layer of assumptions which exist in all specific scientific theories: design is placed in the deep metaphysical zone which is the basis for particular scientific theories and which directs the explanation of natural phenomena. Building on the previously mentioned Faraday, Maxwell has a similar notion about scientists who believe in the ontological reality of a supernatural designer (and sustainer) which could be ascribed to Herschel, Newton, Copernicus, Mendel, Kelvin, Planck, etc. – a list of many others is long and cannot be presented here. At worst for the illegitimacy position, this list clearly suggests that the metaphysical assumption of a supernatural design(er) should not be an obstacle in creating scientific theories and explanation of phenomena by natural causes. What is not excluded here is the assumption that the naturally produced design of natural things could have been built 'during' some prehistorical, protohistoric events or activity deeply hidden in principally epistemologically inaccessible 'time', processes, primordial conditions, places or otherwise outside of the space and time now in operation. Whatever anybody thinks about the *God of the Gap* category of argument, the claim that nature *per se*

[46] Robert Hazen, *Genesis. The Scientific Quest for Life Origin*, Joseph Henry Press, Washington, DC, 2005, p. 93.

[47] Penny, "An Interpretative Review of the Origin of Life Research"...p. 638.

does not have the ability to behave in some way or produce some class of things, for example moving things faster than light or the origin of life, is in principle not unscientific. Moreover, as a matter of fact, the laws of nature *per definitionem* do not allow some kind of processes, behaviour or result. The logical structure and validity of assumptions of what nature can and cannot do are equivalent. According to this, the assumption of supernatural design is a legitimate layer of scientific thought: the analogies of monoliths and astronauts demonstrated this scientific judgment and the judgement of its legitimacy is in large scope dependent on metaphysical beliefs and not on the empirical aspects of science. Because of all of this, it is reasonable to give a chance to the process of reconsidering the scientific legitimacy of design *as a very general idea inside a conceptual hierarchy of science*. This is accompanied by a request for the right to take a neutral metaphysical position about the underlying metaphysical nature of physical and mechanical forces responsible for the origin of life, as *terminus a quo*, in OoL research.

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