https://doi.org/10.53656/phil2023-03-06

Book Review
Нови заглавия

A BRILLIANT EXAMPLE OF HOW PHILOSOPHY COULD HELP SOLVE SOME OF THE GREATEST CONTEMPORARY PUZZLES IN PHYSICS

Dr. Vladimir Bozhilov, Assoc. Prof.
Sofia University "St. Kliment Ohridski

Abstract. This Review of "Suggested Answers to Philosophical Puzzles" by Prof. Anguel S. Stefanov (Cambridge Scholars Publishing, 2022) concentrates on the astrophysical chapters of the book. Spreading from what is a proper definition of a non-classical scientific theory, to the very nature of spacetime, the puzzle of the origin of the Universe and the appearance of humankind, this fascinating book brings a fresh, deep, and inspirational approach to some of the oldest, yet not resolved puzzles in modern astrophysics.

Keywords: Anguel S. Stefanov; philosophy; physics; cosmology; spacetime; Big Bang; Anthropic Principle; time travel; non-classical theory

Every time an astrophysicist or cosmologist is giving a popular science lecture about the Big Bang theory, a question arises from the audience: what was there *before* the Big Bang? As an astrophysicist and science communicator, I'm very familiar with this situation, since I'm also regularly getting this question during my own presentations. I myself asked this very question to my late professor, Dr. Petar Kunchev, while I was a university student in the Faculty of Physics. The usual answer, according to the Standard Cosmological Model, was given to me by Assoc. Prof. Kunchev: "Time has no meaning *before* the Big Bang. The Universe, space and time, all began in the Big Bang. So the question what was there before it is non-physical". This is the first part of my very answer even today. But still, this answer doesn't satisfy me, because it sounds incomplete, almost theological from a certain point of view.

That's why I was deeply intrigued to find that in the latest book of Prof. Anguel S Stefanov, "Suggested Answers to Philosophical Puzzles" (Cambridge Scholars Publishing, 2022), one of the largest chapters is dedicated to this very issue (this is Chapter 7, Does Big Bang Cosmology Resolve the First of Kant's Antinomies?). In this chapter, as well as throughout the whole book, Prof. Stefanov shows in a brilliant way how philosophy could help solve some of the greatest contemporary puzzles in physics. This is why every physicist should take a brief course in Philosophy, and vice versa. We, as human

beings, could not imagine infinity or a multiverse. However, Prof. Stefanov shows that the philosophical concepts of space and time, according to Immanuel Kant, differ from the same terms used in modern physics. Thus, Big Bang Cosmology do not resolve the first of Kant's antinomies. The beginning of the Universe (and its ultimate fate) is still a subject to debate and the synthesis of insights of modern philosophy and cosmology may lead to the next great leap in this field. Prof. Anguel Stefanov's book certainly gives the background to initiate this synthesis.

Another chapter closely related to the Universe is dedicated to the origin of spacetime and its existence – as substantive or an emergent property of the Universe (see Chapter 5. Spacetime: Substantive or Relational?). Here I must say this is not a resolved puzzle in physics, but Prof. Stefanov gives strong and well-motivated arguments on why spacetime is a real, substantive property of the Universe, and not a relational e.g. emergent one. This is key in regard to the problem of looking at how to combine the two greatest theories of the Universe – quantum mechanics (that governs the physics of the microcosmos, the world of subatomic particles) and General Relativity (the theory of gravity and spacetime that governs the movement of objects in the macrocosmos, the worlds of planets, stars and galaxies). These two theories do not work together though. This gives strong indications that our view of the Universe is far from complete. Some yet unknown, but exciting fundamental breakthrough is still waiting to be discovered.

This feeling, of taking a bold jump in the unknown to uncover some of the greatest mysteries that modern physics still stumbles on, leads to a very optimistic, thought-provoking and insightful experience, as the reader goes through the book of Prof. Anguel S. Stefanov. This human-oriented approach is visible in the entire book and shows once again why incorporating philosophy in physical courses and theories is an important milestone, yet to be achieved.

I shall address one last chapter, which coincidently is the last one of the actual book. This is Chapter 8, Does the Anthropic Principle Explain the Appearance of Man in the Universe? Prof. Stefanov gives a concise summary of the different types and formulations of the Anthropic Principle, both in its weak, strong and strongest approach. The discussion and the conclusions though have important implications to us, as human beings. If the Universe is set in such a way so that we, humans, can exist, this really gives strong background for the existence of a supernatural agent, e.g. a God or Gods. On the other hand, as discussed in this chapter, the very act of humans observing the Universe *creates* the Universe (because of the law of quantum mechanics), this gives humankind almost god-like status. Since the last two interpretations require a significant leap of faith and contradict the empirical approach of modern science, a third option for the appearance of humankind also comes to mind – this is the *Multiverse* interpretation. It gives rise to a great number of universes and many of them would be suitable for life as we know it. Thus, humankind is not unique from the viewpoint of the Multiverse theory. This is the answer that Prof. Stefanov gives in his book, and I would urge every reader, who has ever stumbled on the question of the Anthropic Principle, to read this Chapter.

I would go one more step and add on more detail, though. In a paper, I co-authored (Bozhilov and Forgan, 2010), we give another explanation to the emergence of intelligent civilizations, like ours. This is the so called Entropy Hypothesis. It differs from the ones proposed in Prof. Stefanov's book, but I believe it adds to the discussion. In brief, the Entropy Hypothesis states that:

"The intelligent technological civilizations are a typical (although not guaranteed) consequence of the biological evolution of complex life forms, provided the necessary conditions are met. This is due to the efficiency of technological civilizations at increasing the entropy of their planetary system on very short timescales, satisfying the second law of thermodynamics. The destruction of such a technological civilization, which may be inherent in their evolution, will in general be the most effective way for biological evolution to fulfil the law of entropy. So, whenever the conditions for evolution of complex life forms towards intelligence are met, an intelligent technological civilization will appear, constantly evolve technically until it is self-destructed, colonized by another civilization, or starts colonizing space itself, thus ensuring the increase of entropy on even larger scales." (Bozhilov and Forgan, 2010, p.176).

This approach combines fundamental laws of physics (namely the Second law of thermodynamics) with biology in order to tentatively describe the emergence of intelligent technological civilizations. It is also tested with the help of numerical simulations. Such approaches will, undoubtedly, be key to the next scientific revolution – the one that will combine the laws of fundamental sciences with the vastness of the philosophical concepts. The book "Suggested Answers to Philosophical Puzzles" by Prof. Anguel S. Stefanov is an important milestone in this task.

REFERENCES

STEFANOV, A., 2022. *Suggested Answers to Philosophical Puzzles*. Cambridge Scholars Publishing.

BOZHILOV, V. & Forgan, D., 2010. The Entropy Principle and Influence of Sociological Pressures on SETI. *International Journal of Astrobiology*, Issue 3, p.175-181, Cambridge University Press:, e-print: arXiv:1004.1822

✉ **Dr. Vladimir Bozhilov, Assoc. Prof.**
Author ID (SCOPUS): 36169143400
Researcher ID (Web of Science): AAA-6355-2021
ORCID iD: 0000-0002-3117-7197
Sofia University "St. Kliment Ohridski"
Department of Astronomy
Faculty of Physics
5, "James Bourchier" Blvd.
Sofia, Bulgaria
E-mail: vbozhilov@phys.uni-sofia.bg