

Astrobiology in philosophy or philosophy in astrobiology?*

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1 Philosophical issues in astrobiology

Astrobiology, as the study of origins, evolution, and distribution of life in the universe, combining data from various disciplines, is bridging the gap between asking theoretical philosophical questions about the universe and moving from philosophical to scientific arguments on the subject [3, p. 15]. However, I believe that the opposite is the case as well. For example, the advent of modern physics and cosmology is not a replacement of philosophical questions with “scientific” ones, but a way to ask even more philosophical questions about the nature of reality, physical laws, and the universe in general. The emergence of quantum physics did not resolve philosophical questions once and for all, but established new questions about causality, supervenience, and free will, while recent studies in cosmology and modern physics in general opened up questions about parallel universes, nothingness, the existence of fields before emergence of spacetime and many others.¹ Namely, I will argue that from a philosophical standpoint, astrobiology requires the affirmation of *astrophilosophy*. I will inspect the universal

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¹For example, one might think of indeterminism as a big point in philosophy, opening up new questions about whether our experience and free will are determined or not. Or one might take into account inflationary cosmology (cf. [8], [12] for cosmological and [17] for philosophical background) in which we have quantum fluctuations in “something” before the creation of spacetime.

tendencies of astrobiology which make a specialized *philosophy of astrobiology* a certain conceptual contradiction.

More often than not, researchers are aware of the philosophical background of their work. For example, Fry [7, p. 23] states that philosophical presuppositions guiding science are general, universal claims about nature that transcend limited experience: we, for example, expect natural laws to hold not only on our planet or galaxy, but in the universe at large, but such a claim is not provable or disprovable empirically. Fry [7, p. 34] mentions cases of the Copernican and Darwinian presuppositions. The first one rejects the claim that Earth was uniquely chosen for life, and the latter contends that life emerged and evolved on Earth by natural processes and might do so wherever biogenic conditions prevail. Such claims, she posits, cannot be empirically confirmed nor denied in general, but specific hypotheses derived from the Copernican argument are continuously tested by astrobiologists.

For Jakosky [10, p. 663], finding any life elsewhere that had an origin independent of that on Earth would be philosophically profound, and the significance of a discovery of extraterrestrial life is often linked to the discoveries by Copernicus and Darwin. The discovery of life elsewhere that had an origin independent of life on Earth would indicate that even life was just another example of chemical processes in a planetary environment [10, p. 663], which illustrates the notion that we are not using astrobiological research for a jump from philosophy to science, but we are also using to resolve previous questions and ask new ones. For example, if life was found in the universe, that does not only bear philosophical importance but shifts the question from an ontological and metaphysical one (*Is there life in the universe? Are we the only one in the universe?*) to a question of epistemology and philosophy of mind (*Is it intelligent? If so, how do we revise human epistemology and philosophy of mind to fit the new intelligence?*).

2 Illustration: question of life

Following Jakosky [10], we have peeked into possible issues that an astrobiological discovery of life might solve, but also new issues that it may posit. The standard NASA's definition of life as "a self-sustaining chemical system capable of Darwinian evolution" [13] has often been debated. I am not interested

in definitions here, but in the consequence of finding something for which the consensus would be that it is considered life. Then, I am going to see what philosophical and scientific consequences would be there if such life was proclaimed to be intelligent. Kolb [11, p. 960605-3] mentions the case of viruses, for which the question of whether they are alive or not is based on the definitions of life which include self-replication as a key requirement for life.² This again shows that there are dubious cases that are known to us, and yet do not conform to our definitions.

For Fry [6, p. 389], *the continuity thesis* states that there is no unbridgeable gap between inorganic matter and living systems, and that under suitable physical conditions, the emergence of life is highly probable. She considers this the starting point of turning the question of the origin of life into not only a legitimate scientific question but raises a new philosophical dimension of the life-matter relationship. For Dick [4, p. 645–646], the questions of chance and necessity in the origin of life have deeply profound metaphysical consequences, and astrobiologists place their faith in the necessity, or at least the high probability of the origin of life under proper conditions. For Dick, it is a certain metaphysics of its own for astrobiology, a metaphysical presupposition that there *is* extraterrestrial life, otherwise, they would not be searching for it. Such as stance, Dick emphasizes [4, p. 646], gives rise to various questions close to the philosophy of cosmology, such as the question fine tuning, or to questions related to the anthropic principle.³

Schneider [16, p. 132] tries to establish a definition of *exo-life* and mentions the possibility of applying prototypical relationships developed by Rosch. However, Schneider abandons the idea since Rosch's [15] research deals with words, and raises the question of the futility of defining alien intelligence using distinctly human concepts [16, p. 132]. Such a Gödelian statement definitely holds. However, there is one important point here: *prototypical relationships* may be the key to establishing philosophical concepts. Again, whatever life is, and no matter the way it can be defined, we see the world through human eyes and define it using what is natural to us: human categories. We investigate animal intelligence by comparing it to human intelligence, and we are positing various artificial intelligence problems in order to compare the machine

²Of course, self-replication just by itself is not a key requirement for life, but the disposition to do so.

³See [1] for more details about the anthropic principle.

intelligence with the human mind.⁴ The astrobiological findings may or may not provide us with the discovery of new life, but if they do, our conceptual structure, employed in various sciences, will not change in a hierarchical, but in a graph-like way. We will connect our knowledge of the human world and cognition with alien one. There can be hierarchy involved, but the first step in categorizing and labeling unknown entities is to find similarities to existing structure and see how much they differ from a given prototype.

If such life was found to be intelligent, there is a mentioned shift from trying to find whether something *metaphysically exists* to various *epistemological* and *qualia* issues surrounding it. For example, in such cases, alien intelligence would have to become an object of epistemology as well, and alien knowledge and similar mental states would have been compared to human ones. From the aspect of the philosophy of mind, all of the current theories trying to explain mental states and the emergence of mind would have to deal with a new, perhaps similar, category. Such a discovery would probably open more questions if the beings in question would somehow have quite different cognitive capabilities, reasoning, and similar mechanisms.

3 Conceptual speciesism

Since human knowledge is being gained by scientific inquiry, it is no wonder that scientific disciplines have evolved with humans at their center. For example, psychology is primarily interested in the human mind, sociology is primarily investigating human societies, and cognitive science again has the mind of a man at its core. The same goes for philosophy: philosophy of mind studies the human mind as its core object, epistemology is dealing with human knowledge and beliefs, while ethics is talking about prescriptive and descriptive human values and morals. We have already caught a glimpse of this in the previous section, taking into account that we are subjecting machines to the same intelligence criteria as humans. The human mind seems natural to us since it is the only conceptual apparatus we know. I am going to call such an inherent stance

⁴To illustrate, animal cognition deals with the aspects of animal cognition judging from a human conceptual standpoint. For example, there are traces of intentionality, beliefs, first and second-order beliefs, etc., rising from cognitive science and philosophy. On the other hand, notions of strong AI or artificial general intelligence are again measured by human standards, with various tests such as the Turing test, that humans should be able to pass easily.

conceptual speciesism, by which I am referring to the human point of view as the standard to which other objects or concepts are measured in scientific context and used in conceptual apparatus.

The existence of astrobiology already has influenced various scientific disciplines. For example, the term *exoplanets* is referring to planets outside our Solar system, again hinting to our conceptual speciesism since planets in the Solar system are just “planets”. The very name *astrobiology* tries to talk about not just *biology*. There is a bit of uncertainty already present in the name. If biology was not Earth-centric, as other sciences definitely are, then astrobiology would just be called biology. By employing terms such as “astrophysics” or “astrobiology”, we are either 1) hinting towards different physics and different biology 2) talking about specialized areas: physics applied to astronomical phenomena and biology applied to extraterrestrial biology 3) talking about a more generalized approach to usually terrestrial science. It seems that “astrophysics” and “astrobiology” differ here, even though they might be seen as similar terms. For Ćirković, astrobiological problems are necessarily connected to cosmological problems. He highlights that the subject of astrobiology is cosmic life, not just extraterrestrial life [2, p. 14]. However, a view that astrophysics studies physics in general is seldom found, while astrobiology is often considered to be a superset of biology or a supervenient amalgam of various disciplines. The “Canonical Three”, emphasizes Ćirković [2, p. 11], are: 1) How does life begin and develop? 2) Does life exist elsewhere in the universe? 3) What is the future of life and intelligence on Earth and in space? Dunér [5, p. 4] also emphasizes the “universal” sense of astrobiology since astrobiology is important for the self-understanding of humankind itself and our place in the universe.

Ever since the advent of space programs, there are “aspirations for universality” present: the possibility of universal biology, and the search for life in the universe [4, p. 643]. Dick [4, p. 22] mentions that the twentieth-century view of a universe full of life can best be seen as a cosmology in its own right, a *biophysical cosmology* that asserts the importance of both the physical and biological components of the universe. He states that it makes a claim about the large-scale nature of the universe, where life is not only a possible implication but also a basic property of the universe, a notion that redefines our place in the universe. Dick differentiates between the philosophy of astronomy, the philosophy of cosmology, and the philosophy of astrobiology. For him, the

philosophy of astronomy and the philosophy of cosmology are closely related since cosmology can be seen as a branch of astronomy, but he highlights the differences in the main issues posited by the philosophers and the scientists: the philosophy of cosmology is mostly dealing with space and time, and concepts such as fields, energy, and mass [4, p. 636–639].

4 Philosophy in/of astrobiology

Dick [4, p. 631] emphasizes that although the philosophy of science and of specific sciences such as physics or biology are well-developed fields, the philosophy of astronomy and cosmology have received little systematic attention. He identifies six categories of issues: 1) the nature of reasoning 2) the problematic nature of evidence and inference 3) the influence of metaphysical preconceptions and non-scientific worldviews 4) the epistemological status of astronomy and its concepts 5) the role of technology in shaping astronomy 6) mutual interactions of astronomy and cosmology with society over time [4, p. 631]. Astrobiology can then be seen as a specific case study of such issues.

Persson [14] has made a big step in emphasizing philosophical questions in astrobiology, such as: justification of resources and connection with ethics, the question of life in general and its definition, the (im)possibility of knowledge of being alone or not in the universe, our stance and ethics towards extraterrestrial life, issues with governing uninhabited worlds, along with ecological questions. There are, of course, more questions, especially related to the philosophy of politics applied to ownership and governance over exoplanetary and extraterrestrial systems and phenomena. The definition of life itself also has metaphysical consequences, since it is also an ontological question, giving us either categorial similarity (cf. prototype theory) or dissimilarity, and establishing a new kind, which is of metaphysical importance. Such questions are intriguing but are being posited as philosophical questions in astrobiology, and not a part of philosophy of astrobiology. I agree with Persson that “astrobiological questions can give new perspectives to old questions and even pose new questions” [14, p. 41], but we have mentioned the consensus for *universal tendencies* in astrobiology. Then, if its subsets have philosophical disciplines studying those subsets, it would seem appropriate to have a specialized *philosophy of astrobiology*.

For Dunér [5, p. 5], the philosophy of astrobiology is “an ongoing existential

exercise in individual and collective self-understanding”, i.e. finding the human place in the universe. Its major task is constructing and debating concepts such as the concept of life, which may again take into account prototypical relationships, since dogs are better examples of life than arsenic microbes [5, p. 6]. Dunér [5, p. 6–7] also raises ethical questions regarding resource mining, possible contamination of life, or money spent on various programs, epistemological questions concerning the limits of astrobiological knowledge, linguistics and semiotic questions regarding interstellar communication, and issues in cognition, i.e., the definition of intelligence and cognition in general.

5 Philosophy and astrobiology

Dunér’s *philosophy of astrobiology* [5] is certainly asking the right questions and connecting various philosophical issues into a philosophical subdiscipline. Other questions could be emphasized here as well, but we need to trace our steps back to the original tendency of astrobiology to be a universal discipline. If astrobiology is studying life in general as a superset of all possible life “kinds”, language and communication in general as a superset of all universal communication, knowledge and cognition as universal phenomena, then it may seem redundant to actually have a specialized field of philosophy of astrobiology since there is no special subdiscipline or distinct phenomena or a specialized view we are dealing with. What I think and what the mentioned prominent researchers have claimed as well, astrobiology is mostly aiming to *study universal phenomena*, i.e. life in general as a universal phenomenon (both in the meaning of generality and spanning from our universe) and all philosophical issues connected to it.

There are two possible ways to resolve this. The first one is to redefine philosophy. This, of course, will not make a lot of people happy. This does not only work for philosophy but for similar disciplines as well. Consider finding intelligent life. Such intelligent life will have a certain kind of cognition, mental states, and beliefs of various orders, but also a certain kind of psychology. In that case, cognitive science and psychology would have to take into account such minds as well, along with philosophy of mind. If they do not, they are again prone to conceptual speciesism. In such a case, it would seem metaphysically impossible to classify it as an ontologically different phenomenon just because it is from another planet. Therefore, a prototypical comparison to a human

mind would take place. If such a thing happens, then we would need a general discipline studying *the mind* as a universal phenomenon, the same way *life* would be. A similar path would be taken for all major concepts related to beings, their behavior, and intelligence. The philosophy of mind would then be the study of a universal mind or various particular intelligent minds we might find, while epistemology would study knowledge, representation, justification, and beliefs in different kinds of intelligent agents.

The other solution, which would probably keep things (and concepts) at bay, is to consider the need for *astrophilosophy*. A seemingly similar proposition was brought to light by Hegner [9], who wanted to differentiate between astrobiological and astrophilosophical concepts. For example, life is a subject of biology, but questions like whether life has value are questions for philosophy. For Hegner, astrophilosophy would concern itself with questions that are “philosophical in nature but procured but an astrobiological perspective” [9, p. 67]. Such questions, I believe, would be a matter of the philosophy of astrobiology, in which astrobiology is not having such universal tendencies, but has extraterrestrial life and concepts in its core rather than *all* life. If astrobiology really aims to explain life and connected concepts in a *universal* way, along with questions of ethics, politics, epistemology, metaphysics, cognition, etc., then it has all the goals of what we know as *philosophy*, but from a large-scale point of view.

By taking into account universal aspirations of astrobiology, the philosophy of astrobiology becomes a philosophy of not only extraterrestrial life but of universal phenomena in general, including life. Astrophilosophy, in this case, would be a governing superset of philosophy, asking the most fundamental universal questions that are researching general concepts in the universe which are describing particular phenomena, whatever their categorical similarities or dissimilarities may be. I would expect astrophilosophy to still have prototypical relationships to human concepts, as I would expect an intelligent extraterrestrial life to have its own, possibly metaphysically different philosophy that would become a basis of their comparison. If astro-biology studies life in general, then astro-philosophy should study philosophical questions in general, taking into account the possibility of a different kind of science and different kinds of intelligent minds.

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