

On the applicability of dialetheism to the emergence of life and the classification of viruses

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ABSTRACT

We have found that the principles of dialetheism, which state that some contradictions (typically at the limits of a system) may be true, and which amply demonstrate the limits of thought and conception, can be valuable in sorting out and clarifying various astrobiological problems. Examples include the classification of viruses as alive or not alive, and the description of the abiotic-to-biotic transition. We also note the limits of our conception of the extraterrestrial life.

Keywords: Dialetheism, true contradictions, limits of conception, Aristotelian logic, Hegel's dialectics, abiotic-to-biotic transition, quantity-to-quality transition, classification of viruses, extraterrestrial life

1. INTRODUCTION

Life presumably emerged by a transition from an abiotic physico-chemical system to a biotic one. To describe this transition we have considered a model in which life arises from abiotic matter by a quantity-to-quality transition¹. The quantity of the organization and complexity of the abiotic matter gives rise to a new quality, namely life¹. In an earlier paper we have proposed the existence of a transition zone between the abiotic and biotic systems². In this paper we show the contradictions that arise from our attempts to describe the abiotic-to-biotic transition.

In our previous work we have addressed the problem of classification of viruses as alive or not alive when reproduction is used as a key factor in defining life³. We further explore this problem in this paper.

In our previous work we have applied Aristotelian principles, as well as Hegel's logic and dialectics, to various problems in astrobiology^{1, 3}. We continue the trend and now we consider a philosophical branch called dialetheism, and its potential usefulness to astrobiology. According to dialetheism some contradictions may be true^{4a, 5}. We apply dialetheism to the problems of the emergence of life from abiotic matter, to the classification of viruses as alive or not alive, and to our conception of the extraterrestrial life.

2. FROM ARISTOTLE TO HEGEL TO PRIEST: A BRIEF REVIEW

In this section we give a brief review of the philosophical principles of Aristotle⁶, Hegel^{7, 8} and Priest^{4, 5}, which are applicable to our paper.

Most traditional scientific reasoning has a foundation in Aristotle's logic, such as his law of non-contradiction (it is impossible for both p and $not-p$ to be true; cannot be and $not-be$ at the same time)⁶.

Hegel^{7, 8} introduced his dialectic, in which contradictions can be transcended. Hegel believed that everything contains its opposite, and thus is contradictory. Everything is what it is because of its opposite. The master-slave opposite illustrates the point, because neither master nor slave is meaningful without the other. Hegel's thesis and antithesis are in conflict or contradiction. The solution to the contradiction is a synthesis of the thesis and antithesis. This is the famous Hegelian triad consisting of a thesis, antithesis and synthesis. We have found Hegel's laws of logic valuable regarding quantity-to-quality transitions when describing the abiotic-to-biotic transition¹. Hegel's dialectics and his laws of logic can successfully explain a build-up of higher complexity and the emergence of new qualities. However, they do not have an obvious predictive power. Does every combination of a thesis and antithesis lead to a synthesis?

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Is there a reverse process, a degradation of a synthesis to its starting components, and if so, what are the conditions under which this occurs?

Priest^{4, 5}, like Hegel^{7, 8}, does not follow Aristotelian logic. Priest examines the limits of the mind, thought, concepts, expressions, descriptions, conceptions, and knowing. These limits are boundaries which cannot be crossed, and yet they are crossed. Transcendence beyond these limits may create contradictions. Priest believes that some contradictions may be true. Thus, both the statement and its negations could be true. This belief is termed dialetheism (Greek: *aletheia* = truth; *di-aletheia* = a two-way truth). We believe that the limit of conception^{4b} is particularly applicable to the question of the existence of extraterrestrial life and its properties.

3. BACKGROUND ON THE PROBLEM OF THE DEFINITION OF LIFE, ITS ORIGINS, AND THE RELATED PROBLEMS

There have been many attempts to propose a definition for life which would be all-encompassing and relevant to as many diverse life forms as possible. Some definitions of life have favored the algorithmic and other reductionist approaches, while some others have been more empirical and descriptive of specific life properties, which presumably characterize life fully. We point the readers to our recent papers^{1, 3} which summarize many of the definitions and list numerous major references and reviews on the topic. We also recommend two recent papers by Lazcano⁹ and Forterre and Gribaldo¹⁰.

Despite all the efforts directed towards defining life, we still do not have a satisfactory definition which is universally accepted and applicable to a wide variety of life forms. Most definitions overemphasize the requirement for replication. This leads to an absurd classification of the sterile organisms as not-alive³. The definitional requirement that all life forms must engage in independent replication creates a problem in the classification of viruses. As entities that cannot reproduce on their own, viruses must be regarded as entities that are not-alive by such a replication requirement. Sometimes the viruses are classified as belonging to a “twilight zone of life”³.

The proper definition of life should also include its origins. Most scientists believe that life evolved by the chemical evolution of abiotic matter. However, the understanding of the nature of the transition between the abiotic and biotic is murky at best². Consequently, the description of this transition is difficult.

In the next two sections we show how the application of dialetheism can help us clarify the classification of viruses and the description of the abiotic-to-biotic transition.

4. THE EXAMPLE OF VIRUSES

Viruses may be considered not-alive based on the criterion that they cannot reproduce on their own^{3, 11, 12}. The non-reproductive form of viruses would be their virion phase. However, when the virions penetrate the cells of their hosts, they become capable of reproduction with the help of their hosts. In their hosts, viruses act as alive if we accept assisted reproduction as a valid mode of reproduction. Thus, viruses may be considered as being both alive and not-alive. This would be a true contradiction. To resolve this contradiction, we can propose that it is not necessarily true that *alive* and *not-alive* are the only two options. The option of being *both alive and not-alive* may have validity since it appears to adequately describe viruses. Such an option would be a problem for the Aristotelian law of non-contradiction, but not for dialetheism.

5. THE EXAMPLE OF THE TRANSITION ZONE BETWEEN THE ABIOTIC AND THE BIOTIC

One of the central concerns of astrobiology is the nature of the transition from abiotic to biotic states. We have proposed that there is a transition zone between the abiotic and biotic². We have also described this transition via Hegel’s law for quantity-to-quality transitions¹, in which the quantity of the chemicals in the prebiotic soup or in a similar prebiotic system, makes a transition to a new quality, that of life. Various questions arise about this model. At which point is the quantity transformed to a new quality? Not all accumulations of quantity lead to a new quality. When does the quantity and complexity of the prebiotic soup result in the emergence of a new quality, that of the biotic, rather than in the deterioration of complexity, for example? These questions are currently under study.

We find dialetheism useful in describing the transition from the abiotic to the biotic. The two commonly considered states, those of the abiotic and the biotic, do not have to be necessarily the only two mutually exclusive states. A third state could exist, a transition zone, for example, which has some properties of both states, the abiotic and the biotic. The obvious need for a third category, both *abiotic and biotic*, is usually not explicitly acknowledged, probably because it

violates the law of non-contradiction. Instead, linguistic constructions such as “the transition zone”, “order at the edge of the chaos”, among others, have been used ². Yet, such constructs clearly describe conditions which have characteristics of both the abiotic and the biotic. It is dialetheism which points to the need to state such transitional conditions clearly.

Priest gives a nice example of a true contradiction, which will not alarm anybody. It is a case of a person leaving the room. At some point in this transition, the person will be both inside and outside the room. It is easy to visualize this. Our case of the abiotic to biotic transition is more complicated, since the transition involves the appearance of a new quality, that of life, while in the case of the person leaving the room to go outside, the person’s “essence” does not change. Priest ^{4c} stated: “...according to Hegel, something which is changing from being F to not being F is, in the transition, both F and not F”. This fits perfectly the case of the transition zone between the abiotic and the biotic, as having properties of both.

6. A NOTE ON THE DIALETHEISTIC APPROACH TO EXTRATERRESTRIAL LIFE

We know about terrestrial life and many of its properties. In contrast, we do not know if extraterrestrial life exists or not, and if it does, what are its properties. We cross the conceptual boundary of terrestrial life systems and transcend beyond them to the unknown of putative extraterrestrial life. The limits of our conception of the unknown create various philosophical problems, which have been addressed by Priest ^{4b}. Problems with the conceptions of alien life have been recognized ¹³, although they were not specifically linked to dialetheism. Examples include our Earth-centric view of life and our belief that extraterrestrial life should be similar or possibly even identical to ours. The problem arises when we apply Earth-centric conceptions - for example, when we apply the requirement that a living cell must have a specific minimum size, and that it also must contain a basic minimum genetic system. If we apply these requirements to extraterrestrial life forms that might have even smaller forms, which violate our Earth-centric requirements, then we may miss any extraterrestrial fossils that may be left in meteorites, for example.

7. CONCLUSIONS

We have found that the principles of dialetheism, which state that some contradictions (typically at the limits of a system) may be true, and which amply demonstrate the limits of thought and conception, can be valuable in sorting out and clarifying various astrobiological problems. Examples include the classification of viruses as alive or not-alive, the description of abiotic-to-biotic transitions, and the recognition of the limits of our conception of extraterrestrial life.

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