OTHER: A multidisciplinary approach to the search for other inhabited worlds

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Resumen / En la historia del pensamiento científico, filosófico y religioso aparece de manera recurrente la posibilidad de la existencia de vida en otros mundos. La búsqueda de vida inteligente extraterrestre despierta una gran fascinación en la opinión pública que refleja el interés natural del ser humano en este tema. Desde el punto de vista científico, no se conoce ninguna civilización inteligente además de la nuestra, lo que plantea cuestiones que requieren una cuidadosa reflexión y la confluencia de diversas disciplinas. Así, la empresa de búsqueda y posible detección de vida inteligente presenta nuevos desafíos y nuevas fronteras tanto para la ciencia como para la filosofía y la religión. En este trabajo se presenta un proyecto interdisciplinar para discutir el posible impacto del potencial descubrimiento de una civilización extraterrestre en la concepción filosófica, social y religiosa de nuestra propia civilización. Este enfoque requiere definir preguntas acerca de la naturaleza de la vida, la inteligencia y la espiritualidad, como así también sobre las posibles escalas y el alcance de las civilizaciones. Entre otras cuestiones se analiza la posibilidad y las consecuencias, en distintos ámbitos, de que seamos la primera y única civilización tecnológicamente avanzada en la historia del universo.

Abstract / We present project OTHER (Otros mundos, tierra, humanidad, and espacio remoto), a multidisciplinary laboratory of ideas, that addresses questions related to the scientific search for extraterrestrial intelligent life such as: what is life? how did it originate? what might be the criteria that we adopt to identify what we might call an extraterrestrial civilization? As a starting point, we consider the Drake equation which offers a platform from which to address these questions in a multidisciplinary approach. As part of the project OTHER, we propose to develop and explain the last two parameters of the Drake equation that we call the cultural factors: the fraction of intelligent civilizations that want or seek to communicate $f_{\rm c}$, and the average life time of the same, L. The innovation of the project OTHER is the multidisciplinary approach in the context of the Argentine community. Our goal is to provide new ideas that could offer new perspectives on the old question: Are we alone?

Keywords / Extraterrestrial Intelligence – History and philosophy of astronomy

1. Introduction

Are we alone? This question has triggered many scientific projects on the search for life in the Universe, especially for extraterrestrial intelligent (ETI) life. Considering the growing number of discovered "Earth-like" exoplanets located within the circumstellar habitable zone, the potential discovery of the existence of an ETI species elsewhere in the galaxy and then our potential "first contact" might have a profound impact on our scientific, philosophical, and social comprehension of humanity.

The current scientific search for ETI poses questions that scientists could attempt to answer from a purely scientific point of view: What is life? How did it originate? What might be the criteria that we adopt to identify what we might call an ETI civilization? etc. However, such an important quest requires a thoughtful reflection from the perspectives of a variety of epistemological disciplines. The project OTHER (Otros mundos, tierra, humanidad, and espacio remoto) is a laboratory of ideas that deals with these and other similar questions.

2. The Drake Equation: a heuristic device

The Drake Equation (Drake, 1965) offers a platform from which to address the questions mentioned in the Introduction in a multidisciplinary approach. The equation quantifies the number of technological civilizations from whom we might receive a radio signal:

$$N = R^* \, f_{\rm p} \, n_{\rm e} \, f_{\rm l} \, f_{\rm i} \, f_c \, L, \qquad (1)$$

where N is the number of civilizations in the Milky Way Galaxy whose electromagnetic emissions are detectable, R^* is the rate of formation of stars in our galaxy suitable for the development of intelligent life, $f_{\rm p}$ is the fraction of those stars that have planetary systems, $n_{\rm e}$ is the number of planets per stellar system with an environment suitable for life, $f_{\rm l}$ is the fraction of suitable planets on which life actually appears, $f_{\rm i}$ is the fraction of inhabited planets on which intelligent life exists, f_c is the fraction of intelligent civilizations that develop technology that releases detectable signs of their existence, and L is the length of time such civilizations send detectable signs. These factors can be grouped into three classes: astronomical ($R^*, f_{\rm p}, n_{\rm e}$), biological ($f_{\rm l}, f_{\rm i}$), and cultural ($f_{\rm c}, L$).

As pointed out by Vakoch & Dowd (2015), the equation can be used as a heuristic device to consider the different aspects that lead to the emergence of civilizations that actively seek to communicate with others.

Also, the equation presents a simplistic approach to the problem and lacks precise measurements of all its factors. It relies on a number of assumptions, for instance, that the emission of signals is possible once a civilization has reached a given technological status, disregarding of whether they want to show themselves or not. Given its flaws, the equation is considered as a guide for the discussion of the different aspects that intervene in the posibility of a contact between civilizations. Another critic on this equation is that if purely frequentist formulation the fact that the development of communicating planets is actually a stochastic process (Glade et al., 2012).

In a first approach, it is difficult to establish a net separation between the different factors. No inhabited planet has been discovered yet, however the galaxy seems to abound in biofriendly planets that might be cradles of civilizations. While the first factors ($R^*, f_\mathrm{p}, n_\mathrm{e}$) can be determined with increasing precisions, the latter ones pose big questions that cannot only be approached from a scientific point of view.

3. The origin of life

The quest for the origin and evolution of life is a crucial question in a multidisciplinary approach to the search for inhabited worlds. Life could have been originated on the surface of the Earth, in outer space (panspermia) or in the interior of the Earth. It is not yet possible to determine which physical and chemical processes can transform matter into living organisms. Most scientists think that life could arise wherever conditions permit. Therefore, life would be in the natural order of things, written in the laws of nature. In this sense the Universe is biofrendly (Davies, 1999).

We do not understand yet how the astronomical factors can interact with the biological ones. We only know one case: planet Earth. The more complex life is, the more rare convergence is likely to be. Complexity in life-forms is an integration of temporal evolution and probabilistic events (Cabrol, 2016).

The phenomenon of life is more remarkable than the other processes that give rise to planets, stars, galaxies, etc. (Davies, 1999). The origin and evolution of life has profound philosophical implications.

4. Intelligence, culture and religion in the Drake equation

The past and present of Astrobiology roadmaps have not been focused on the understanding how intelligent life interacts with its environment and communicates. There are subsequent questions to this goal: how abundant and diverse is intelligent life in the Universe? how does intelligent life communicate? how can we detect intelligent life? (Cabrol, 2016).

As part of the project OTHER, we propose to develop and explain the last two parameters of the Drake

Figure 1. Logo of the project OTHER (Otros mundos, tierra, humanidad, and espacio remoto)

equation, that we call the cultural factors: the fraction of intelligent civilizations that want or seek to communicate f_c, and the average life time of the same, L.

The introduction of the cultural factors allows to focus the discussion to incorporate cultural and religious aspects, studied in terms of the development of our own human evolution. If life is a common characteristic of the Universe, we can assume that after a long evolutionary process life will have evolved into a Symbolic Species (Deacon, 1997). According to Deacon, forms of iconic and indexical communication are present in many species on Earth, but only humans have built on thought and communication symbolically. It is the case that transcendental or religious consciousness is made possible by symbolic thinking, then a religious disposition should be considered a universal consequence of the symbolic capacity (Deacon & Cashman, 2010).

An educated guess indicates that these ETI might have developed the ability to communicate symbolically and might have cultivated a religious disposition. We can further speculate that ETs might have at one time been at the brink of destroying themselves; and, still further, we can speculate that they might have overcome this challenge by saving their civilization and their planet. Would their religious disposition have been an impediment or a help to overcome self-destruction?

Among other issues we propose to analyze the possibility and consequences, in different areas, of being the first and only technologically advanced civilization in the history of the Universe.

5. Conclusion

As it is well known, the search for ETI is quite difficult. It is not simple to establish a test or standards that we can use to judge or evaluate the success of our efforts. As Cabrol (2016) points out in her review on the search for ETI: "To find ET, we must expand our minds beyond a deeply rooted Earth-centric perspective and re-evaluate concepts that are taken for granted". The innovation of the project OTHER is the multidisciplinary approach in the Argentine community. Our goal is to provide new ideas that could offer new perspectives on the old question: Are we alone?

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