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Cognitive Astrobiology

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Abstract. Traditionally the search for extraterrestrial intelligence (SETI) has been mostly a kind of engineering task, based on two assumptions: the existence of other technological culture somewhere in our Galaxy and that this culture is using radiotechnology that can be detected with our receivers. However, SETI endeavors could benefit more by expanding its scope into two-folded interdisciplinary research program, one exploring the nature of human, other animals, and artificial cognition, and the another exploring all possible and hypothetical ways and channels that potential ETI could use to manifest itself. This kind of new research program could be named cognitive astrobiology in order to better describe its research areas.

Keywords. SETI, Cognitive Science

1. Introduction

We don't know how unique creatures we are in the Universe. We don't even know how unique phenomenon life is in the Universe. But we know that humans are the only creatures on Earth that have created science and technology. We have languages that are capable of limitless expression and efficient communication. Although many animals behave clearly intelligently, no other animal can human linguistic utterances ((Impey C. Ed. 2010)). Is language the enhancer of our thinking or even enabler of our abstract symbolic cognition? Why such rich languages have evolved on humans only among all possible species and during billions of years of evolution? What does this mean for the possibility of creatures that are functionally equivalent of humans to exist somewhere else in the Universe ((Duner David. 2013)DunerDavid2014DunerDavid2011)?

Human evolution and cultural history are not uniform, linear evolution towards modern (western) civilization. Rather modern civilization is the product of cumulative information and skills recorded and transferred extrasomatically from different cultures and traditions throughout the ages. It is said, that stone age human had already all the cognitive abilities as modern-day humans. Co-evolution of cognition and language made it possible to permanently record and efficiently transfer ideas and information from human to human, from generation to generation. This led to co-evolution of brain and culture. How human cognitive abilities then differ from other animals? Is the difference only quantitative, not qualitative? Is the ability to learn and use language the only thing that distinguishes us from other higher animals in cognitive level? Are we just the first specie to achieve science and technology on Earth, or are we product of series of improbable coincidences?

2. Cognitive Astrobiology

Cognitive astrobiology is an early state research area combining two multidisciplinary research areas: cognitive science and astrobiology. One of the confluences of these two

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areas is the research of human specific cognitive abilities and the possibility of the emergence of similar abilities in somewhere else in the Universe.

The Search for Extraterrestrial Intelligence (SETI) has been searching for artificial signals for more than 50 years. During these years SETI research has assumed that (or at least is possible that) human- like intelligence and technology could evolve also somewhere else in the Milky Way. However, intelligence is controversial and vague concept.

Using single IQ value for instance does not talk much about logical, productive and creative minds. Cognitive astrobiology can clarify the concept of intelligence by searching the features of the most general, multiple realizable rational cognition, functionally equivalent of humans.

We do not know what possible evolutionary paths there to intelligent society and technological culture are. Does technology always come along when a certain point in social or cultural evolution has been passed? What environmental, physiological, and anatomical features are required for technical culture to emerge? In a way, this is a similar question to the origin of life. We have only one example of life and technological culture, and it is hard to imagine alternatives. Besides complex cognition, technological civilization requires complex manipulative organs too. Otherwise, we would end up with super-intelligent culture of e.g. octopus- or whale-like creatures that could be in some of the nearest exoplanets without us knowing anything about them.

3. Discussion

Fermi's paradox says that if there are other advanced civilizations in the Milky Way, then where are they? This is a serious question to any claim about how life would eventually evolve to something that could make it more observable than just biochemically. How meaningful then is the search for extraterrestrial intelligence? There are countless challenges to classic radio SETI; like that it relies on accidentally picking up signals leaked from other civilizations. It seems more likely, that advanced technological culture would probably limit such wasted energy. After all thinkable searching solutions are tested; we still don't know whether extraterrestrial civilizations exist. Justification for the search comes from the cost-effectiveness: we only must keep our eyes open for any anomalies.

Classical approach of cognitive science has an idea about multiple realizability which states that cognitive processes do not depend on the physical implementation of an intelligent system ((Fodor F. 1975)). This statement allows intelligence and mind to very different entities, e.g. robots, green slime and Boltzmann brains. While this cognitivism has been criticized for forgetting the biological and sociocultural sides of the mind, intelligence *per se* could be multiple realizable emergent property of different cognitive agents in different environments.

Astrobiology has been mainly focused on disciplines like biology and astronomy. However, if we want to add SETI, or just technosignature search into astrobiology research area, then we need also co-operation with cognitive science, neuroscience, comparative zoology, psychology, AI research, etc. to assess the possibility of multiple realizable intelligent creatures, functionally equivalent of humans, somehow manifesting themselves in our Galaxy. Cognitive astrobiology is searching for universal features that make up human cognition. For example, there is proposed universal grammar (UG) by Chomsky (N. 1966). Evolution in very different environments could produce similar cognitions to cope with the survival pressure from it. Brainstorming with researchers from multidisciplinary areas like cognitive science could produce some insight into what could be universal to all possible cognitions, on Earth, and in the Universe.

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