

Defining civilization utilizing anthropic reasoning

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Abstract

We utilize anthropic reasoning to demonstrate that we are typical observers of our reference class under a self-sampling assumption by investigating the definition of what a civilization is. With reference to the conflict between such reasoning and the observational lack of extra-terrestrial intelligent life, we conclude that a part of our theoretical understanding of the Universe will be at fault.

1 Introduction

There exist certain physical observations that we should not be at all surprised about. What we can expect to observe is restricted a priori by the conditions that are necessary for us to exist in the first place¹. Necessarily, if intelligent life forms did not evolve in the Universe, then such observations could not take place at all^{2,3}. Yet the question of what our own circumstances should be remains a taxing issue⁴: are we typical of all observers in the Universe? Indeed, Bostrom⁵ suggests reasoning that we should think of ourselves as a random sample derived from the set of all observers in our reference class under a ‘self-sampling assumption’.

One immediate question that arises is how should we define our own reference class? Bostrom⁵ includes all observers who have existed in the past and all those who will exist in the future. Olum⁶ favours adding to Bostrom’s reference class all those observers who might potentially have existed as well. Yet removing these extensions and confining our reference class to only those observers who exist presently, there is still conflict between anthropic reasoning and observation⁴ such that we would expect ourselves to be part of a titanic (inter-) galactic civilization rather than being part of a uniplanetary one. In numerical terms, only 1 in 100 million individuals would not be part of such a civilization at a pan-galactic level⁴.

In general, the assumptions that underscore this anthropic reasoning are inflationary⁷: in an

infinite Universe, there logically exist such titanic civilizations^{3,4}. Given that ‘they’ should already be here and are not³, there are a number of scenarios for the resolution of this problem⁴. In this work, we focus on an observational approach to resolving this conflict.

2 Defining civilization

Observationally, it is self-evident that we are part of a civilization. The definition of what a civilization is, however, is somewhat tricky and potentially arbitrary. For example, let us consider ourselves as being part of a civilization based on present-day national borders where voluntary migration is uncommon. Unless we have emigrated away from our nation, we would not be surprised to find out that we are typical members of said civilization. Conversely, if we have migrated, we would also be unsurprised that we constitute a small minority of the populous in our new residential country.

By taking this example further, we can consider our national boundary to be the Earth. This in turn expands our reference class to all individuals present on Earth. Again, we would be unsurprised that we are a national of this planet. Assuming extra-terrestrial intelligence does exist, then we may migrate to their planets where we would unsurprisingly be in the minority. Yet we could now consider ourselves to be part of some greater civilization with a different (arbitrary) border such as a pan-galactic one that consisted of all intelligent life in the Galaxy. The reference class that we now have is exactly as defined in section 1. We conclude that we would still be typical galaxy nationals despite our divergent heritages under the self-sampling assumption.

This line of reasoning indicates a type of selection effect in how civilizations are defined. Specifically, we have used at each step only those observers whom we know by direct observation to be existent. It appears that by only considering our observations rather than the (theoretically) implied observations of vast civilizations, we are typical observers of our reference class; even when accounting for a finite speed of light.

3 Implications

Returning to our present knowledge base, it is clear that we have only observed our own Earthbound civilization. Further, it is highly probable that there is not any ‘local’ extra-terrestrial intelligence waiting to be discovered³. Importantly, we do not know anything about the existence of such

beings at larger distances. The inference that they may exist is theoretically based rather than observationally. There is no observational evidence of absence beyond our local stellar region.

We therefore find it probable that it is not anthropic reasoning that is at fault. Although more detailed observations of exo-planets will be required, more likely the flaw in the conflict lies within a theoretical aspect coupled with the use of theoretical observers in our reference class. Specifically with reference to Olum⁴, these flaws are: few civilizations are able to grow to titanic proportions; the Universe is finite; or large-scale inter-stellar colonization is near impossible.

4 Summary

We have investigated the definition of civilization and applied anthropic reasoning to suggest that we are typical residents of our neighbourhood: whether this is in an Earthbound context or spatially more extended. Thus we reject the supposition that anthropic reasoning is invalid and favour that either our theoretical understanding of the Universe, our understanding of our colonization ability or the use of theoretical observers is at fault.

Acknowledgements

KAP thanks the staff at both the University of Durham and the University of Queensland for their support. This work was supported by an EPSA University of Queensland research fellowship.

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