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What if we are alone?

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1. Introduction

The huge number of planets in the observable Universe, and beyond, means that worlds with Earth- like levels of biodiversity are inevitable even if the probability of any given planet being inhabited is tiny. The corollary of this is that the existence of one such world (the Earth) tells us almost nothing about how common such places are in the Universe. Hence, given the present state of astrobiological knowledge, it is possible that there are no other inhabited planets within the detection-range of any conceivable technology. This is not a popular view currently but the little evidence we have (e.g. the coincidence of stellar-evolution and intelligence-evolution time- scales on Earth [1,2]; indications that many of the Earth's properties may be fine-tuned for complex life [3,4]; the fact that life on Earth was, for most of its history, single-celled [5]) points towards complex life, at least, being rare in the Universe.

The plausibility of this "gloomy" view will be teste d further in coming decades as we explore Mars, Europa, Titan and other astrobiologically interesting worlds in the Solar System and as we, hopefully, develop ever more sophisticated remote-sensing methods for assessing the biological state of exoplanets. Much thought has been given to the political, social and psychological effects of a positive detection of alien life or even the receiving of a confirmed SETI signal. However, in my view, it is equally important and interesting to consider the impact of negative results. What if we are alone? What if the only other life we find is "primitive"?

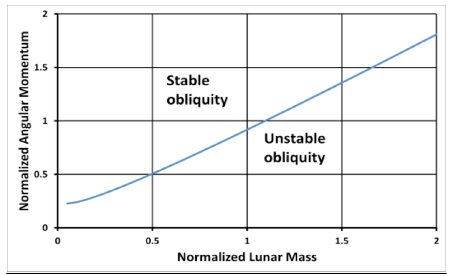

Figure 1: Evidence for fine tuning. Critical angular momentum for axial stability after 4.5 Gy as a function of lunar mass. Note that increases in lunar mass will change a stable system into an unstable one and that the true Earth-Moon system (L=1, m=1) is almost unstable. After [3].

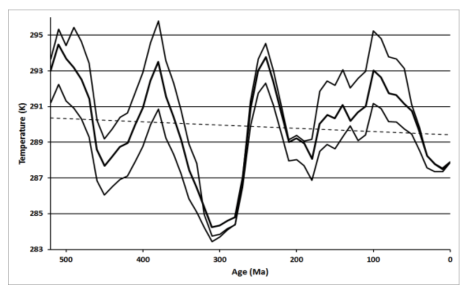

Figure 2: Evidence for fine tuning. Mean global temperatures through the last 540 My. Note decreasing temperature despite increase in solar luminosity of ~5%. Implication is that there has been a fortuitous cancellation of solar heating by geological and biological evolution. After [4].

2. Impacts of Failure

The impacts of failure to discover life beyond our planet are not all negative. At a very practical level, planetary-protection would become much less important both from the point of view of protecting the Earth and from the point of view of maintaining the pristine state of other worlds. Furthermore, the realization that the Earth is special can only help reinforce the importance of protecting our biosphere from the negative effects of industrialization and human population growth. Nevertheless, consistent failure over many decades to find life elsewhere would inevitably have a damping effect upon searches for alien biospheres. In the longer term still, a successful discovery of life in our stellar neighbourhood would almost certainly stimulate attempts to send probes to the stars and so failure to find habitable worlds could substantially delay any such projects.

A great deal has been written, and a few surveys of attitudes undertaken, investigating the impact of the discovery of alien life. Little has been done to look at the impacts of decades of negative results however. Future surveys and studies in this field should take this into account and, where practicable, broaden their approach to look at the societal impacts of failure as well as success.

3. Discussion and Conclusions

TBC

References

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