

Abstract for AbSciCon 2022

The theory of an extremely rare Earth is proposed to explain the observed extraordinary sophistication of the operation of the Earth System (ES) and the maintenance of this operation for four billion years with eventual emergency of human civilisation.

The theory is based on the assumptions (i) that the universe is infinite in extent, and (ii) that quantum theory allows a particle have an infinite spread in the possibility for its position. This allows that “anything that can happen will happen”. Furthermore, however unlikely an event or situation might be, it will crop up an infinite number of times across the infinite universe though with a finite likelihood within a given space such as the visible universe (a volume with radius ~ 13.4 billion light-years).

The theory is based on different degrees of unlikelihood in an infinite universe with quantum phenomena at the atomic level. For explanatory purposes, a scale of 1 to 4 degrees of unlikelihood is proposed as on a Richter scale of significance.

In this theory the emergence of life is extremely unlikely because it is dependent on quantum uncertainty of position. The necessary atoms came together by chance to coalesce into a structure with everything it needed for heritable and evolvable self-reproduction. The unlikelihood of such coalescence would be most extreme (at degree 4 on the scale), since it was based on quantum effects; whereas the conditions for growing, reproducing and evolving would be of a lower order (at degree 3). The probability of both happening together is of the same order of unlikelihood as the first.

Note that, however infrequently life emerges, it will happen an infinite number of times across an infinite universe. Our own “planet with life” will be typical of the infinite number of other “planets with life” spread across the infinite universe. The theory predicts that there is a very small but finite probability (degree 4) of another planet with life within the range of our visible universe and an even smaller probability (still degree 4) of another planet with intelligent life.

Given that our “planet with life” is typical, the observed sophistication of the Earth System must be typical for the generation of intelligent life. If it were not so, we would not be here to observe it. We are only here by a succession of flukes, which included the most extreme flukes of the emergence of life and the emergence of civilisation.

The Earth-Moon system is extremely precisely configured to produce Milankovitch cycles which, over the last 2.5 million years have driven the planet in and out glaciation, with oscillations in temperature and sea-level critical for the evolution of *Homo sapiens* and civilisation. If this precision was at an unlikelihood of degree 3, then the steps in evolution must have been of even higher degree.

The chance of there being another planet like ours with life, let alone intelligent life is highly unlikely in the observable universe.