

“Curve of the End of the World” in the *hard-life* scenario

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Common expectations for widespread life in the universe are theoretically supported by the *easy-life* scenario, which considers biological evolution as a sequence of highly probable transitions, occurring on any habitable planet. On the opposite side, a less popular scientific point of view (yet Copernican) is the *hard-life* scenario, supposing that the Earth might be a rare case of planetary evolution due to a sequence of low-probability transitions, which we notice only because of the (anthropic) selection effect requiring the presence of observers.

The number of critical evolutionary steps considered in the literature [1] [2], according to biological and paleontological issues, is generally small (from 5 to 7). A complete conception admits the possibility that the sequence of evolutionary transitions, leading to intelligent life, may include *hard* and *soft* steps as well.

In this Poster, it is explained how the *hard-life* scenario poses a surprising mortgage on the future of the Earth. Computations refer to the general framework, treating together both *hard* and *easy* evolutionary steps, which is introduced by the Author in an *oral* presentation at this Meeting.

A predictive curve is derived, describing the probability that the “End of the World” (egress of the Earth from the Habitable Zone) might occur at a given time in the future, depending on the parameters of the model. The results are displayed in the Figures, showing that *hard* scenarios with a large number of steps (> 6 or 7) imply uncomfortably short lifetimes for the biosphere. On the other side, the presence of an *easy* step leading from animals to cognitive intelligence has the effect of lengthening this lifetime expectation.

[1] Carter, 2008, Int. J. Astrobiology, **7**, 177

[2] Watson, 2008, Astrobiology, **8**, 175

Notes/Comments:

We submit this work for Poster presentation, on Wednesday (Section 3).

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