

Is the emergence of life on Earth an example of guided self-organization?

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Even if we can reduce the problem of the spontaneous emergence of life on Earth to the problem of understanding the spontaneous emergence of information that self-replicates, many factors that can affect the likelihood of spontaneous emergence of information in a complex environment are not well understood. From a conservative point of view, the spontaneous emergence of sufficient information is impossible: the likelihood is simply too small to be achievable even in thousands of lifetimes of the universe. But these conservative estimates assume "uniform priors", that is, they assume that the probability of formation of monomers and dimers, as well as their polymerization, is random. If a rudimentary template-based assembly system can be found to modify the likelihoods for monomer and dimer formation "in the right direction", a sequence of modified priors could lead to a sufficient amount of "prior information" so that the spontaneous emergence of life becomes a likely event. I discuss this problem in a microcosm: the digital life platform "Avida", in which self-replicating computer programs can live, evolve and grow in complexity. I explore the chance emergence of life in this system by testing billions of sequences of random instructions, using both uniform and biased probability distributions that themselves change the bias.