Abstract Submitted
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Noise-Induced Homochirality in Spatially Extended Chemical and Biological Systems[1] FARSHID JAFARPOUR, TOMMASO BIANCALANI, NIGEL GOLDENFELD, Department of Physics and The Institute for Genomic Biology, University of Illinois at Urbana-Champaign — Autocatalysis has long been assumed to be the primary mechanism for homochirality in chemical and biological systems. The connection between autocatalysis and homochirality was originally established in a model by F. C. Frank [1], which included nonlinearity through an annihilation reaction. This extra reaction, which is not of the autocatalytic form, introduces fixed points in the dynamics at mean field level, which are identified as homochiral states. Here we remove this extra reaction, so that at the mean field level the only fixed point is the racemic state. Nevertheless, solving the full stochastic theory in zero dimensions, we show that homochiral states can arise due to intrinsic noise. Finally we explore whether these homochiral states are stable in spatially-extended systems.

[1] F. Frank, Biochimica et biophysica acta 11, 459 (1953).

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Farshid Jafarpour
Department of Physics and The Institute for Genomic Biology,
University of Illinois at Urbana-Champaign

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