

Non-stochastic spontaneous symmetry breaking: What kind of weak asymmetric forces is propelling?

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Abstract

We give a survey over recently published laboratory experiments on mirror-image chemical processes - inclusively new studies - that are mainly related to aggregation and crystallisation effects and have in common the observation of unexpected non-stochastic behaviour. While the outcome of these experiments should be rationally predicted as stochastic, *i.e.* to produce a statistically equal amount of left-handed and right-handed molecules or entities, the laboratory observations demonstrate in various cases exactly the contrary: one enantiomeric form arises persistently in significantly higher amounts than the other. These processes describe non-stochastic mirror-symmetry breaking and are related to far-from-equilibrium autocatalytic dynamics. The puzzling non-stochastic effects are often attributed to the presence of unknown chiral impurities mainly coming from the bio-organic environment. However, there is some indication that the impurity supposition not always holds, so that other influences such as the parity-violating energy difference (PVED) or other unspecified physical factors in combination with nonlinear kinetics should be additionally taken into account.

Key Words: chirality, mirror-symmetry breaking, non-stochastic behaviour, crystallisation