

Cross-Catalysis between Self-Replicators of Different Handedness

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ABSTRACT Life, as we know it today, requires the homochirality of its constituents. Yet it is likely that the prebiotic soup was a racemic mixture of molecules. It remains an open question at which point in evolution homochirality became necessary for life. Self-replicating molecules are expected to be a possible link between inanimate and animate matter. We here report the interplay between chirality and self-replication, and specifically investigated cross-catalysis between replicating species containing building blocks of different handedness. We find that, although replication of species from the same handedness is more efficient in isolated systems, non-stereoselective cross-catalysis dominates and leads to the formation of heterochiral self-replicators when a racemic mixture of building blocks is provided. These results demonstrate that homochirality is not a prerequisite for self-replication, and that chiral symmetry breaking could have occurred after the emergence of self-replicating systems from racemic mixtures.

Keywords: self-replication; homochirality; origin of life; systems chemistry; autocatalysis
