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DISSERTATION TITLE: *On Asymmetric Autocatalysis: a chemical tool for chiral induction and remote asymmetric amplification*

The addition of diisopropylzinc to pyrimidine carbaldehydes has become the only example of asymmetric autocatalysis with amplification of enantiomeric excess. This remarkable reaction was discovered in 1990 and has become known as the Soai reaction. The reaction has received immense attention over the last decade because it is capable of providing an enantiopure product from an essentially achiral precursor and can be used as a model to help us understand the origin of biological homochirality.

This thesis discusses a new methodology which makes use of the Soai reaction to propagate chirality. The methodology couples asymmetric autocatalysis with asymmetric alkylation to access enantioenriched propargylic alcohols. Therefore, the autocatalyst is generated from minimal enantiopurity and provides entries to enantioenriched chiral molecules. This novel approach opens for alternative asymmetric processes, as it does not rely on the chiral pool.

A different and complementary methodology towards the remote amplification of chirality is also presented. Target organic molecules are enantiomerically enriched through an asymmetric autocatalytic relay for remote amplification of chirality in a responsive chemical system. We demonstrate that alkynols with very low initial enantiomeric excess can trigger the formation of their own chiral catalyst by asymmetric autocatalysis, which in turn enables the formation of the same alkynols with greater enantiomeric purity.

Experiments indicating a nonlinear effect between the autocatalyst and the final product afforded a better understanding of the mechanistic aspects of this reaction. Kinetic measurements showing the influence of the nonlinear effect on the rate of reaction are also discussed.

The results obtained from this study showed that the Soai reaction may offer numerous opportunities in asymmetric catalysis research. This autocatalyst can be used to induce chirality in other organic reactions where catalysts available from the chiral pool have traditionally been used.