# New Concepts for Organocatalysis

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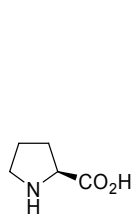
While enzymes use a variety of different catalytic strategies, chemists have largely limited themselves to metal-based catalysts. There is no disadvantage in using metal catalysts but a greater diversity in catalytic strategies will certainly benefit the development of new, practical, broadly applicable, and economically and ecologically acceptable synthetic methods.

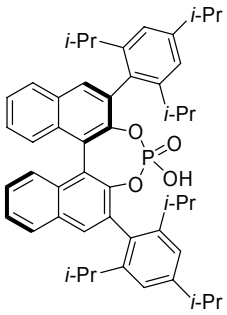
In recent years we have realized that organocatalysis, *the catalysis with low-molecular weight catalysts where a metal is not part of the catalytic principle or the reaction substrate*, can be as efficient and selective as metal-catalysis. Important discoveries in this area include novel Lewis base-catalyzed enantioselective processes and, more recently, simple Brønsted acid organocatalysts that rival the efficiency of traditional metal-based asymmetric Lewis acid-catalysts.

Contributions to organocatalysis form our laboratories include several new amine- and amino acid-catalyzed asymmetric reactions.[1] We have discovered the proline-catalyzed direct asymmetric intermolecular aldol reaction. Soon after this we developed novel organocatalytic asymmetric Mannich-, Michael-, α-amination-, intramolecular enolexo-aldolization, and aldehyde α-alkylation reactions. In addition, collaborative results with K. N. Houk and W. Thiel have provided a clearer mechanistic understanding of enamine catalysis and provided the basis for the design of aminocatalytic reactions.

Our latest work in the area of organocatalysis deals with chiral Brønsted acid catalysis. Based on these studies we have very recently developed a surprising and novel strategy for asymmetric catalysis.




*(S)-Proline*

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References:

(1) (a) List, B. *Acc. Chem. Res.* **2004**, *37*, 548. (b) List, B. *Chem. Comm.* **2006**, 819. (c) List, B., Yang, J. W. *Science* **2006**, *313* (5793), 1584.