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GUEST EDITORIAL

Asymmetric Organocatalysis

In the year 2000, *Accounts of Chemical Research* published a landmark special edition on the timely subject of asymmetric catalysis, edited by Scott Denmark and Erik Jacobsen. The broad utility of synthetic chiral molecules as single-enantiomer pharmaceuticals, in electronic and optical devices, as components in polymers with novel properties, and as probes of biological function, has made asymmetric catalysis a prominent area of investigation. Ten papers in that special issue were concerned with the use of chiral transition metal catalysts, while only two dealt with small organic molecule catalysts, now appropriately termed organocatalysts. Four years later, *Accounts of Chemical Research* devotes a special edition solely to the area of Asymmetric Organocatalysis. How did this come about?

Until a few years ago, it was generally accepted that transition metal complexes and enzymes were the two main classes of very efficient asymmetric catalysts. Synthetic chemists have scarcely used small organic molecules as catalysts throughout the last century, even though some of the very first asymmetric catalysts were purely organic molecules. Already in 1912, Bredig reported a modestly enantioselective alkaloid-catalyzed cyanohydrin synthesis. In the 1960s, Pracejus showed that organocatalysts can give significant enantioselectivities. The 1970s brought a milestone in the area of asymmetric organocatalysis, when two industrial groups led by Hajos at Roche and Wiechert at Schering published the first and highly enantioselective catalytic aldol reactions using the simple amino acid proline as the catalyst. The cinchona alkaloids and proline stood as the only familiar organocatalysts for some time.

By contrast to the relative inattention paid to organocatalysts by chemists, biological evolution has led to metal catalysis and organocatalysis in equal measure. Chemists have focused on transition metal catalysts, and their success in this endeavor led to the Nobel Prize in Chemistry in 2001. A change in perception occurred during the last few years when several reports confirmed

that relatively simple organic molecules can be highly effective and remarkably enantioselective catalysts of a variety of fundamentally important transformations. This rediscovery has initiated an explosive growth of research activities in organocatalysis both in industry and in academia. As realization grows that organic molecules not only have ease of manipulation and a "green" advantage but also can be very efficient catalysts, asymmetric organocatalysis may begin to catch up with the spectacular advancements of enantioselective transition metal catalysis.

We are proud to present this special edition on Asymmetric Organocatalysis and are delighted that many of the leading members of the growing organocatalysis research community have agreed to contribute. We have chosen to group the papers according to a mechanistic classification, where the catalysts are either Lewis acids, Lewis bases, Brønsted acids, or Brønsted bases. While this approach has certain limitations when mechanisms are not always completely known, it has the advantage of giving the area a logical structure. Furthermore, the mechanistic classification reveals once more the dominance of Lewis base organocatalysts. We were unable to get our busy colleagues to produce an Account on enantioselective Brønsted acid catalysis, a promising area that gained significantly in importance during the last years. Despite this, all main areas of asymmetric organocatalysis are covered in superb Accounts by experts from all over the world. We hope that this issue inspires readers to think about using organocatalysis in their own synthetic projects and, even more importantly, to participate in the development of new catalysis concepts in an exciting and rapidly developing field.

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