

Benjamin List

Subjects: [Chemistry](#), [Organic](#)

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[Organocatalysis](#)[Asymmetric Catalysis](#)[Green Chemistry](#)[Proline Catalysis](#)[Nobel Prize](#)[Enantioselective Synthesis](#)[Confined Acids](#)[Hydrogen Bonding](#)[Max Planck Institute](#)[Catalyst Design](#)

Basic Information



Name: Benjamin List
(Jan 1968–)

Birth Frankfurt, Germany

Location:

Title: Director, Max-Planck-Institut für Kohlenforschung

Affiliation: Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr, Germany

Honors: Nobel Prize in Chemistry (2021) Gottfried Wilhelm Leibniz Prize Member of the German National Academy of Sciences Leopoldina

1. Introduction

Benjamin List is a German chemist internationally recognized for pioneering the field of [asymmetric organocatalysis](#).^[1] Born in Frankfurt in 1968, he obtained his Ph.D. in chemistry from Goethe University Frankfurt under Johann Mulzer. Following postdoctoral research with Richard Lerner and Carlos F. Barbas III at The Scripps Research Institute, he joined the Max-Planck-Institut für Kohlenforschung, where he currently serves as director.^[2] ^[3] His early vision for organocatalysis set the foundation for an entirely new class of catalysis based on small organic molecules.

2. Scientific Contributions

In 2000, List published the first report demonstrating that the amino acid proline can catalyze intermolecular aldol reactions enantioselectively,^[4] establishing the principle of **asymmetric organocatalysis**. This marked a paradigm shift in catalysis, introducing a concept that circumvented the need for metal complexes or enzymes to achieve stereoselective transformations. His work demonstrated that simple organic molecules could serve as efficient chiral catalysts, offering a metal-free, environmentally friendly alternative in asymmetric synthesis.^{[5][4]}

Following this landmark discovery, List and his group explored a broad range of organocatalytic reactions, including **Enamine Catalysis**,^[6] **Mannich reactions**,^[7] **Michael additions**,^[5] and **asymmetric epoxidations**.^{[5][8]} They introduced the concept of **confined acids** and developed highly selective catalysts by embedding acidic functional groups within rigid chiral environments.^{[8][9][10]} These advances significantly expanded the scope and selectivity of organocatalytic processes. His team's efforts also focused on mechanistic insights, demonstrating the importance of stereoelectronic effects and non-covalent interactions in achieving high levels of enantioselectivity.

In addition to practical applications, List's contributions have deepened our fundamental understanding of reaction mechanisms. He has championed the role of hydrogen bonding, non-covalent interactions, and catalyst design in enhancing enantioselectivity. His catalysts are widely used in the pharmaceutical and fine chemical industries, and his approach has influenced synthetic planning on both academic and industrial scales.^[11] For example, his organocatalysts have been employed in the synthesis of active pharmaceutical ingredients, agrochemicals, and natural product frameworks.

3. Impact and Recognition

In 2021, Benjamin List was awarded the **Nobel Prize in Chemistry**, shared with **David W. C. MacMillan**, for the development of **asymmetric organocatalysis**.^{[2][1]} His discovery not only revolutionized catalysis but also met critical demands for **sustainable and green chemistry**, reducing the dependency on toxic or rare metals. This recognition highlighted the global significance of his work and the growing adoption of organocatalysis in diverse chemical industries.

Other accolades include the **Gottfried Wilhelm Leibniz Prize**, the highest honor in German research, and membership in the **Leopoldina**, Germany's National Academy of Sciences.^[3] He is frequently invited to deliver plenary lectures at major international conferences and has authored numerous influential publications in top-tier journals. In addition, List serves on editorial boards and has played a pivotal role in advancing the field through his involvement in high-impact scientific publishing.

4. Mentorship and Vision

List has trained and mentored a generation of chemists, many of whom have advanced to significant positions in academia and industry. His research group at the Max Planck Institute is known for its interdisciplinary environment and innovation-driven approach to catalysis. He continues to advocate for bold, conceptual research and remains a leading voice in pushing the boundaries of organic chemistry.^[3]

His vision extends beyond the lab; he is committed to promoting open scientific exchange and has participated in outreach efforts to communicate the power of chemistry to broader audiences. As a thought leader in catalysis, Benjamin List continues to redefine what is possible in organic synthesis, paving the way for sustainable, precise, and elegant chemical transformations.

Further Reading

<https://www.youtube.com/watch?v=fFW42p1ky90> <https://www.youtube.com/watch?v=iKdNO0D6a8Q>

References

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