



## THE NOBEL PRIZE IN CHEMISTRY 2021

Benjamin List and David MacMillan were awarded the Nobel Prize in Chemistry 2021 for the development of asymmetric organocatalysis.

Catalysis is the process of accelerating a chemical reaction using substances known as catalysts that do not react with the final product. In organic catalysis, organic compounds made from elements like carbon, hydrogen, sulfur, phosphorus, and other non-metals are used as catalysts.

### JOHAN ÅQVIST

chair of the Nobel Committee for Chemistry:

“This concept for catalysis is as simple as it is ingenious, and the fact is that many people have wondered why we didn’t think of it earlier.”

Previously, catalysts were mostly metal or enzyme compounds. Large-scale industrial production of the former was quite expensive, as metals react readily with oxygen. On top of this, it was not very eco-friendly, as many of the metals that successfully accelerate chemical reactions are toxic and often made their way into the environment, polluting it. Before this year’s Laureates’ discovery, scientists were yet to come up with an optimal way to use enzyme-based catalysts: complex protein compounds that accelerate reactions in living beings.

Completely independently of each other, David MacMillan and Benjamin List developed a third method of catalysis that leverages organic compounds. It has been named asymmetric organocatalysis. This method has had a huge impact on the development of new drugs and has made chemistry more environmentally friendly.

As the Nobel Prize’s press release states: “Using these reactions, researchers can now more efficiently construct anything from new pharmaceuticals to molecules that can capture light in solar cells.”

In particular, the method makes it easier to obtain so-called “chiral compounds”, paired molecules where the structure of one is a mirror image of the other. Each may possess different properties; for example, they may smell differently or react differently, and thanks to asymmetric organocatalysis, scientists can produce only the desired compound.

“This concept for catalysis is as simple as it is ingenious, and the fact is that many people have wondered why we didn’t think of it earlier,” said Johan Åqvist, chair of the Nobel Committee for Chemistry.

The awards ceremony took place online. Besides their medals and certificates, the Laureates also received SEK 10 million between them (over USD 1.14 million at the current exchange rate).

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## Background

Benjamin List is a German chemist who works at the Max-Planck-Institut für Kohlenforschung (the Max Planck Institute for Coal Research).

David MacMillan is a British chemist who is now based in the USA, where he works at Princeton University.

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*Source* (<https://www.nobelprize.org/prizes/chemistry/2021/press-release/>)