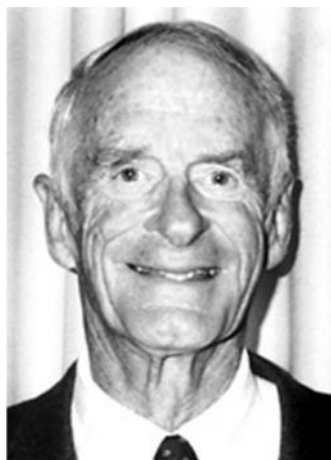


Nobel Prize in Chemistry 2001



William S. Knowles



Ryoji Noyori



K. Barry Sharpless

The Nobel Prize in Chemistry 2001 was divided, one half jointly to William S. Knowles and Ryoji Noyori "for their work on *chirally catalysed hydrogenation reactions*" and the other half to K. Barry Sharpless "for his work on *chirally catalysed oxidation reactions*".

Information about winners:

William S. Knowles

St Louis, Missouri, USA, and

Ryoji Noyori

Nagoya University, Chikusa, Nagoya, Japan,

K. Barry Sharpless

the Scripps Research Institute, La Jolla, California, USA,

Summary of research work:

Mirror Image Catalysis

Many molecules appear in two forms that mirror each other – just as our hands mirror each other. Such molecules are called *chiral*. In nature one of these forms is often dominant, so in our cells one of these mirror images of a molecule fits "like a glove", in contrast to the other one which may even be harmful. Pharmaceutical products often

consist of chiral molecules, and the difference between the two forms can be a matter of life and death – as was the case, for example, in the thalidomide disaster in the 1960s. That is why it is vital to be able to produce the two chiral forms separately.

This year's Nobel Laureates in Chemistry have developed molecules that can catalyse important reactions so that only one of the two mirror image forms is produced. The catalyst molecule, which itself is chiral, speeds up the reaction without being consumed. Just one of these molecules can produce millions of molecules of the desired mirror image form.

William S. Knowles discovered that it was possible to use transition metals to make chiral catalysts for an important type of reaction called *hydrogenation*, thereby obtaining the desired mirror image form as the final product. His research quickly led to an industrial process for the production of the L-DOPA drug which is used in the treatment of Parkinson's disease. Ryoji Noyori has led the further development of this process to today's general chiral catalysts for hydrogenation.

K. Barry Sharpless, on the other hand, is awarded half of the Prize for developing chiral catalysts for another important type of reaction – *oxidation*. The Laureates have opened up a completely new field of research in which it is possible to synthesise molecules and material with new properties. Today the results of their basic research are being used in a number of industrial syntheses of pharmaceutical products such as antibiotics, anti-inflammatory drugs and heart medicines.

[For more details please visit:](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2001/popular.html)

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