

Elias James Corey—Nobel Prize for Retrosynthetic Analysis

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The American chemist Elias James Corey was awarded the 1990 Nobel Prize for chemistry “for his development of the theory and methodology of organic synthesis.” He called his method “retrosynthetic analysis,” a technique for simplifying the synthesis of large complex molecules. He worked out and described in detail a new and fruitful systematic approach to synthetic chemistry. He has synthesized more than 100 substances, including ginkgolide B (a compound extracted from the ginkgo tree and used experimentally to treat asthma) and prostaglandins (hormonelike compounds used to induce labor and treat infertility).

William James Corey was born on July 12, 1928, in Methuen, an industrial town in northeastern Massachusetts, about 30 miles north of Boston. His father, Elias Corey, a businessman, died 18 months later, and his wife changed her son’s name from “William” to “Elias.” He attended the Saint Laurence O’Toole Elementary School in Lawrence (near Methuen) and graduated from Lawrence Public High School at age 16 years in 1945. He then entered the Massachusetts Institute of Technology in Cambridge, from which he received a BS degree in 1948 and a PhD degree in 1951.

After receiving his doctorate, Corey became a lecturer in chemistry at the University of Illinois in Champaign-Urbana, where he taught from 1951 to 1959, becoming an assistant professor in 1953 and a full professor in 1956. From 1955 to 1957, he was a Sloan Foundation Fellow and became a Guggenheim Fellow in 1957.

Corey left the University of Illinois in 1959 to become professor of chemistry at Harvard University, Cambridge, Massachusetts. In 1967, he was appointed the Sheldon Emory

Professor and became a Guggenheim Fellow (1968-1969). While at Harvard University, he synthesized about 100 molecules that previously were found only in nature. From 1965 to 1968, he served as chairman of the chemistry department at Harvard University.

Corey has written more than 700 papers on chemical subjects. In his first papers, published in the late 1960s, he described a broad, methodical approach that he called “retrosynthetic analysis.” Before Corey’s method became standard practice, most organic chemists used an ad hoc approach to synthesis. To make complex natural molecules, they first identified a smaller, simpler molecular within its structure that could be made easily or that was already available. Second, they tried to manipulate this simple molecule to generate the more complex target molecule. This method involved considerable trial and error.

In Corey’s method, chemists start with the target molecule and work backward, carefully analyzing its structure and dissecting it piece by piece. By systematically breaking key chemical bonds that join the major components of the target molecule, they ultimately arrive at a set of simple precursors. These precursors can be reassembled into the target molecule in the least possible number of steps using the simplest possible reactions, thereby making the synthesis faster, cheaper, and more efficient. Corey described his method of retrosynthetic analysis in *The Logic of Chemical Synthesis*, published in 1989.

Elias James Corey has received many awards and honors, including honorary degrees, in addition to the Nobel Prize. In 2001, the islands of Antigua and Barbuda issued a stamp in his honor (Scott No. 2518e).

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