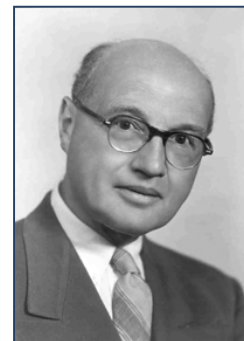


Department of Chemistry

*Izaak Maurits Kolthoff**“Father” of Modern Analytical Chemistry**University of Minnesota**Professor of Chemistry**1927-1962**“Theory Guides; Experiment Decides”*

Izaak Maurits (Piet) Kolthoff is widely considered the “father of modern analytical chemistry.” By applying fundamental physical principles and insights, Kolthoff transformed chemical analysis from a qualitative to a quantitative science. His scientific leadership is shown by his approximately 950 papers, several textbooks, and an array of influential monographs, but his greatest legacy may be the 1,100 doctorate chemists who can trace their academic lineage back to his laboratory.

Born in Almelo, Holland on February 11, 1894, Kolthoff entered the school of pharmacy at the University of Utrecht, Holland in 1911. Influenced by his mentor Professor Nickolas Skoorl, a student of Jacobus Henricus van't Hoff, Kolthoff began to blend the qualitative and quantitative aspects of analytical chemistry. In 1915, Kolthoff published his first paper on the then-novel concept of pH, and also received his *Apotheker* degree. By the time Kolthoff received his doctorate in chemistry in 1918, he had already published 32 papers, a model of success for any aspiring graduate student. After earning his doctorate, Kolthoff remained at the University of Utrecht for approximately nine years, lecturing on electrochemistry, titrimetry, and precipitation. Kolthoff's thoughtful application of more developed disciplines to analytical chemistry, combined with 270 publications, gave him a world-wide reputation that came to the attention of Dean Samuel Lind at the University of Minnesota. Kolthoff accepted a one-year trial appointment for the 1927-1928 academic year to head the analytical chemistry program, and this blossomed into a 64-year career. Although Kolthoff officially retired in 1962, he continued to conduct research, hold grants, and publish until 1991, primarily with his long-term postdoctorate Miran Chantooni. Professor Kolthoff passed away, at the age of 99, in St. Paul, Minnesota.

Professor Kolthoff's research covered numerous areas of chemistry, focusing primarily on constructing a firm scientific foundation for analytical chemistry. His research transformed the discipline from a collection of empirical recipes and prescriptions to a fundamental branch of modern chemistry. Kolthoff and his students studied acid-base indicators and redox chemistry, non-aqueous solution chemistry, gravimetric analysis, volumetric analysis, iodometry, the theory of colloids, and crystal growth. His work with acids and bases was the first to fully apply the Arrhenius theory of electrolytes, and it changed titrimetry from a practical art to an exact science. He also developed theories of potentiometric analysis and titrations as well as conductometric titrations. When Jaroslav Heyrovsky at the Charles University in Prague, Czechoslovakia discovered polarography in 1925 (for which he eventually received a 1959 Nobel Prize), Kolthoff immediately recognized its scientific significance and practical importance. This work eventually led to the development of novel methods of environmental trace metal analysis and biological sensors. Kolthoff was among the first scientists to understand the fundamental significance of crown ethers and their complexes, so it is fitting that Jean-Marie Lehn, (who would go on to receive the 1987 Nobel Prize in Chemistry for his work on host-guest chemistry) held the inaugural Kolthoff Lectureship in 1979.

Beyond his remarkable productivity in terms of peer-reviewed original research publications, Kolthoff authored many books, including the multi-volume monograph “Volumetric Analysis” with Vernon Stenger, “Polarography” with J.J. Lingane, and “Potentiometric Titrations” with H.A. Laitinen. Kolthoff was also the editor-in-chief of the “Treatise on Analytical Chemistry,” which comprised 19 volumes in two editions. His most influential book was probably “Quantitative Inorganic Analysis,” written with Ernest B. Sandell, his one-time student and then University of Minnesota faculty colleague. This definitive volume was published in four editions (the last co-authored by Minnesota colleagues Sandell, Edward Meehan, and Stanley Bruckenstein) and in six languages, including Russian and Japanese.

In addition to his academic contributions, Kolthoff was an influential spokesperson for the discipline, both in this country and abroad. Kolthoff participated in the founding of the American Chemical Society (ACS) Division of Analytical Chemistry in 1938, the launch of the ACS journal *Analytical Chemistry* in 1947, and in the establishment of the Analytical Chemistry Division of the International Union of Pure and Applied Chemistry (IUPAC) in 1951.

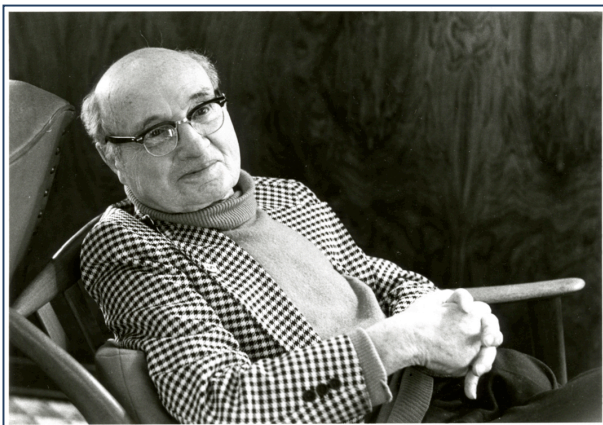
During World War II, the Japanese occupation of Southeast Asia cut off the United State's access to natural rubber. The federal government established a comprehensive synthetic rubber research program in several major industrial and university research centers. Kolthoff, whose family was devastated during the Nazi occupation of the Netherlands, quickly assembled a large research group and authored several key patents related to synthetic rubber. This work greatly advanced the field of emulsion polymerization.

After the war, Kolthoff became deeply engaged in humanitarian efforts and the promotion of world peace, especially as an early supporter of the United Nations. In these efforts, he corresponded extensively with Albert Einstein, Pierre Joliot-Curie, Senator Hubert Humphrey, and Eleanor Roosevelt, widow of the late president. He also was an early critic of Senator Joseph McCarthy.



Kolthoff's myriad contributions were recognized by numerous awards, medals, and memberships in learned societies throughout the world. The American Chemical Society bestowed the William H. Nichols Medal (1949), the Fisher award for Analytical Chemistry (1950), the Willard Gibbs Medal Award (1964), and (perhaps of greatest personal significance), the first-ever Award for Excellence in Teaching Analytical Chemistry (1983). Kolthoff was inducted into the U.S. National Academy of Sciences (1958) and knighted by his native Netherlands as a Commander in the Order of Orange-Nassau. He received the Charles Medal of the Charles University in Prague (1964) and the Robert Boyle Medal (1984) from the Royal Society of Chemistry in England. He was also the first recipient (1987) of the eponymous Kolthoff Gold Medal Award in Analytical Chemistry of the American Pharmaceutical Association Academy of Pharmaceutical Scientists. In 1972, the University of Minnesota Board of Regents named a new chemistry research building Kolthoff Hall. In 2012, he was posthumously inducted into the Minnesota Science and Technology Hall of Fame.

Many of Professor Kolthoff's graduate students, including Professors Sandell, Lingane, and Laitinen, who started with Kolthoff as undergraduates, went on successful careers in industry and academia at top institutions such as Harvard, Massachusetts Institute of Technology, Northwestern, and the Universities of Chicago, Michigan, Pittsburgh, Pennsylvania State, and Illinois. Current or past University of Minnesota Chemistry faculty who could trace their scientific roots to Kolthoff include Professors Bruckenstein, Peter Carr, Reynolds, Sandell, Marion Stankovich, and Harold Swofford Jr. Kolthoff's teaching, his students' teaching, and his textbooks have had an immeasurable impact on chemistry education around the world.



In the words of J.J. Lingane:

“ . . . analytical chemistry has never been served by a more original mind, nor a more prolific pen, than Kolthoff's.”