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Pauling L. *The nature of the chemical bond and the structure of molecules and crystals: an introduction to modern structural chemistry.* Ithaca, NY: Cornell University Press, 1939. 429 p.
[California Institute of Technology, Pasadena, CA]

From 1920 to 1939, great progress was made in the understanding of the nature of the chemical bond through the determination of the structure of crystals by X-ray diffraction and of the structure of gas molecules by electron diffraction and in the application of the theory of quantum mechanics to the problem. The results of these studies, with emphasis on my research on the nature of the chemical bond between 1927 and 1933, were summarized in this book. The book has had a significant impact both on chemical education and on research in inorganic chemistry, organic chemistry, mineralogy, biochemistry, molecular biology, and medicine. [The SCI® indicates that all three editions of this book have been explicitly cited in over 16,475 publications since 1955.]

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My interest in the chemical bond began in 1919, which was my first year of college teaching. I taught a sophomore course in quantitative chemical analysis at Oregon Agricultural College. During that year, I read the 1916 paper by Gilbert Newton Lewis[1] on the shared-electron-pair theory of the chemical bond and the 1919 papers by Irving Langmuir.[2,3]

The next year, I returned to my undergraduate studies in chemical engineering at Oregon Agricultural College. In 1922, I became a graduate student in chemistry at the California Institute of Technology. By good fortune, I was able to begin my research by determining the structure of crystals by the X-ray diffraction method under the guidance of Roscoe Gilkey Dickinson. He was the first person to have received a PhD degree from that institution, which was just beginning to develop as an outstanding center of scientific research and education.

From Richard C. Tolman, Harry Bateman, and other remarkable teachers at Caltech, I obtained an excellent grounding in chemistry, physics, and mathematics, with emphasis on the old quantum theory and atomic structure. Quantum mechanics was discovered a few months after I had received my PhD degree. The Schrödinger papers on wave mechanics[4] were published about the time that I arrived at the Institute for Theoretical Physics (Professor Arnold Sommerfield) at the University of Munich in April 1926. I immediately began to apply an approximate quantum mechanical treatment to the problem of the structure of atoms with many electrons and to simple molecules, making use of the treatments of the hydrogen molecule-ion and hydrogen molecule that had been formulated by Ø. Burrau,[5] E.U. Condon,[6] W. Heitler, and F. London.[7] This effect led to the formulation of a set of ionic radii of cations and anions that had a firmer theoretical basis than the earlier empirical values. The effort also led to some principles for determining the structure of ionic substances. In the period from 1931 to 1933, the work led to the development of the concepts of hybridization of bond orbitals, resonance of the molecules among two or more alternative valence-bond structures, and the partial ionic character of covalent bonds and the formulation of the electronegativity table and of the nature of one-electron and three-electron bonds.

These new ideas had applications to many aspects of chemistry. The applications included the nature of square, tetrahedral, and octahedral coordination complexes of metals; the stability of aromatic substances as determined by the resonance energy; the planarity of resonating and conjugated systems of single and double bonds; the secondary structures of proteins and the importance of the hydrogen bond in proteins, polynucleotides, and other substances; and the nature of interatomic forces in metals. The book describing all of these developments, published in 1939, was revised in 1940[8] and in 1960.[9] It has been used in some universities as a textbook in courses in structural chemistry and has also been found useful by many chemists and other scientists in connection with their scientific work. See reference 10 for recent work in this field.

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8. **Pauling L.** *The nature of the chemical bond and the structure of molecules and crystals: an introduction to modern structural chemistry.* Ithaca, NY: Cornell University Press, 1940. 450 p.
9. ----------. *The nature of the chemical bond and the structure of molecules and crystals: an introduction to modern structural chemistry.* Ithaca, NY: Cornell University Press, 1960. 644 p.
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