

Wilson E B, Decius J C & Cross P C. *Molecular vibrations: the theory of infrared and Raman vibrational spectra*. New York: McGraw-Hill, 1955. 388 p.
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This book provides a detailed treatment of the vibrational motions of atoms within a molecule, first in terms of classical mechanics and then as modified by quantum mechanical effects. The use of geometrical symmetry properties to simplify the calculations of vibration frequencies, the intensities of transitions, and other properties using the elegant and simple methods of group theory are emphasized, but no prior knowledge of group theory or any other unfamiliar mathematics is needed. Wide use was made of geometrical symmetry considerations to aid in calculating vibration frequencies, normal modes of vibration, and intensities. [The SCI® indicates that this book has been cited in over 5,110 publications.]

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A rough outline of a plan for this book was prepared by me before the advent of World War II turned our thoughts away from curiosity about the motions of atoms in molecules. We were then assigned to the effort to curb the German submarine menace that was picking off crucial shipping from right off our coast. By the end of the war the U-boat had been defeated by a series of new weapons that included more powerful explosives, better radar, new weapon delivery systems, and better fuses, among others.

Finally, the war ended and most academic scientists returned to their proper activities, exploring domains of pure science that seemed of interest because they "were there" and not fully understood.

We knew that the most exciting practical applications would arise in totally unexpected directions as we learned more and more about pure science. Some uses that involved the vibrations and rotations of molecules included the invention of the laser, the "greenhouse" effect, the "hole in the ozone layer," and tests for all kinds of new materials, such as those that were later identified as menaces to our environment as well as those having important beneficial uses.

We took up again the idea of a book on molecular vibrations with a new collaborator, J.C. Decius, replacing J.B. Howard. P.C. Cross had planned to write a portion dealing with the rotation of molecules, but this was postponed and came out as a separate book, *Molecular Vib-Rotors*, which he coauthored with H.C. Allen.¹

An example of how experts can miss out on applications is provided by the fact that the patent department of Bell Telephone Laboratories opposed the patenting of the laser because they did not think that it had any applications in the telephone business. The mathematical method that we published in 1941² was abstracted in *Chemical Abstracts* under a one-word abstract, "math." By the time we incorporated it into our book, the original publication had itself been cited hundreds of times and was eventually decreed to be a *Citation Classic*.

Though delayed until 1955, our book did ultimately appear in print and in its own right became a frequently cited "classic." Others have joined,³ so today the field of molecular vibrations is no longer a largely unexplored terrain. There are many things worth studying further, but we now know a great deal about the topic—enough to treat many important problems.

1. Allen H C & Cross P C. *Molecular vib-rotors: the theory and interpretation of high resolution infra-red spectra*. New York: Wiley, 1963. 324 p. (Cited 335 times.)
2. Wilson E B. Some mathematical methods for the study of molecular vibrations. *J. Chem. Phys.* 9:76-84, 1941. (Cited 580 times since 1955.) [See also: Wilson E B. Citation Classic. (Thackray A, comp.) *Contemporary classics in physical, chemical, and earth sciences*. Philadelphia: ISI Press, 1986. p. 231.]
3. Mito A, Sakai J & Katayama M. Laser Stark spectroscopy of the Coriolis coupled ν_2 and ν_3 bands of CD₂Cl₂. *J. Mol. Spectrosc.* 112:252-84, 1985.