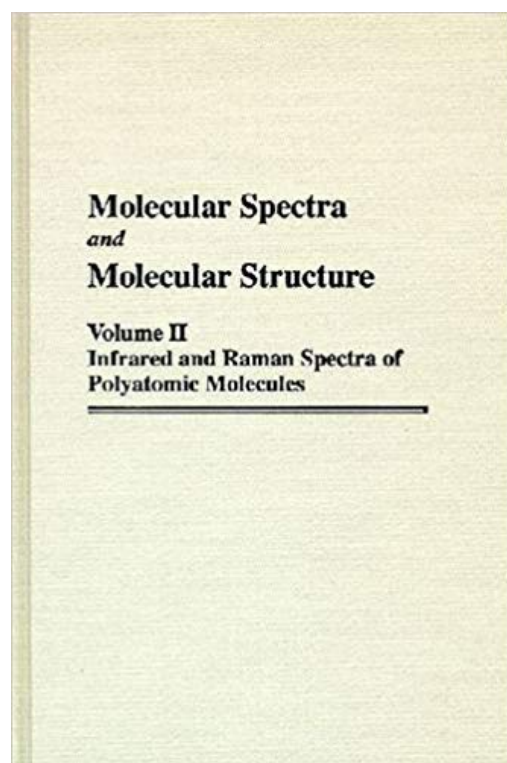


# Molecular Spectra and Molecular Structure: Infrared and Raman of Polyatomic Molecules *by* Gerhard Herzberg



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TEXT BOOK MOLECULAR SPECTRA and MOLECULAR STRUCTURE I. SPECTRA OF DIATOMIC MOLECULES BY GERHARD HERZBERG, F. R. S. National Research Council of Canada With the co-operation, in the first edition, of J. W. T. SPINKS, F. R. S. C. SECOND EDITION, -EIGHTH PRINTING D. VAN NOSTRAND COMPANY, INC. PRINCETON, NEW JERSEY TORONTO LONDON NEW YORK D. VAN NOSTRAND COMPANY, INC. 120 Alexander St., Princeton, New Jersey Principal office 24 West 40 Street, New York 18, New York D. VAN NOSTRAND COMPANY, LTD. 358, Kensington High Street, London, W. 14, England D. VAN NOSTRAND COMPANY Canada, LTD. 25 Hollinger Road, Toronto 16, Canada Copyright 1950 BY D. VAN MOSTRAND COMPANY, INC. Published simultaneously in Canada by D. VAN NOSTRAND COMPANY Canada, LTD. First Edition Copyright 1939 by Prentice-Hall, Inc. No reproduction in any form of this book, in whole or in part except for brief quotation in critical articles or reviews, may be made without written authorization from the publishers. First Published May 1950 Reprinted February 1951, November 1953 November 1955, February 1957, August 1959, December 1961, February 1963 PRINTED IN THE UNITED STATES OF AMERICA Dedicated to the Memory oi WALTER CHARLES MURRAY First President of the University of Saskatchewan PREFACE Eleven years ago I published a volume entitled Molecular Spectra and Molecular Structure I. Diatomic Molecules which was followed in 1945 by a second volume Infrared and Raman Spectra of Polyatomic Molecules. The first volume has been out of print for a number of years but the demand for it seemed to justify a new edition. Although the book has been completely revised and brought up to date, its general plan has remained substantially unchanged. Concerning this plan it seems therefore appropriate to quote from the preface of the first edition I have endeavored to give a presentation which is readable by the beginner in the field and also will be useful to those who do or want to do research work in this field. In order to assist the former, I have frequently made use of small type for those sections that are not necessary for an understanding of the fundamentals. For the benefit of those working in the field, numerous

references to original papers have been included. A satisfactory presentation of molecular spectra and molecular structure is nowadays not possible without treating thoroughly, apart from the empirical results, the theoretical background also. Therefore I have included as much of the theory of molecular spectra as is possible without going into the more difficult mathematical details. A large number of diagrams, graphical representations of eigenfunctions and potential curves, as well as energy level diagrams, serve to illustrate and to explain the theory. On the other hand, I have added numerous carefully selected spectrograms of bands and band systems some of which have been taken specially for this purpose in order to give an accurate idea of the experimental material that forms the basis of the developments. While of course most of the material presented is not new, it seems that the actual procedure followed in analyzing a band spectrum has not previously been given as specifically in a book of this kind. The same holds for the applications of band spectra to other parts of physics, to chemistry, and to astrophysics given in the last chapter. I hope that both these features will be found useful. In the eleven years since the publication of the first edition the subject Spectra of Diatomic Molecules has developed vigorously even though not as rapidly as in the preceding two decades. Most of the progress made has been consolidation and slow evolution rather than revolution. Exceptions to this statement are the amazing advances made by applying the new tools of molecular beams and microwaves to diatomic molecular problems. vi PREFACE Naturally I have incorporated these advances of recent years in the present new edition...



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