with predominantly the same λ conformation as that in the rigid Cu(gly)$_2$(−)chxn, and hence a Cotton effect of the same sign, but smaller magnitude.

An alternative explanation of the CD results, which does not depend on a conformational inversion, may be that in Ni(7-CH$_3$sal)$_2$(−)pn and Ni(acac)$_2$(−)pn the methyl–methyl interaction can only be relieved by distortion of the donor atom symmetry from planarity, as shown in **1**.

In Ni(sal)$_2$(−)pn the optical activity of the d–d transitions results from perturbation of the nondissymmetric, planar NiO_2N_2 (C_{2v}) chromophore by the central ring helicity. The NiO_2N_2 chromophore is itself dissymmetric (C_2) in the other two complexes, the side rings conferring helicity which is right-handed (with respect to the vertical axis), and opposite to that of the central ring.

The copper(II) complexes of the same three ligands show similar sign reversals.[9] This study is being extended to other compounds of the series, in order to make band assignments and provide further tests of the ideas introduced above.

(9) Presented at the 156th National Meeting of the American Chemical Society, Atlantic City, N. J., Sept 1968.

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Book Reviews

Spectroscopic Techniques for Far Infra-red, Submillimetre and Millimetre Waves. Edited by D. H. MARTIN, Queen Mary College, University of London. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1967. vii + 389 pp. 16 × 23 cm. $18.00.

To chemists the far-infrared region, defined by the Triple Commission on Spectroscopy as the range in wavelengths of 50–1000 μm or in wave numbers of 200–10 cm^{-1}, has been of limited usefulness because of the difficulties of working in the region. These have slowly yielded to improvements in instrumentation. Double-beam spectrometers and small interferometers for the far-infrared can now be purchased commercially, though they are still expensive and rather temperamental. The present volume is a collection of seven authoritative articles written by physicists on the instrumentation and methods of spectrometry in the region and the adjacent millimeter wavelength range.

The article titles are Spectrometry between 3 cm^{-1} and 200 cm^{-1}, Fourier Transform Spectroscopy, Grating Spectroscopy, Detectors, Harmonic Generators and Semiconductor Detectors, Coherent Sources Using Electron Beams, and Techniques of Propagation at Millimeter and Submillimeter Wavelengths. The first article, by the editor, D. H. Martin, compares the merits of interferometry and grating spectrometry and concludes strongly in favor of the former. The second, by P. L. Richards, gives the details on which one can base such a conclusion. The third, by G. R. Wilkinson and the editor, is the one likely to be of most interest and usefulness to chemists. In it attention is devoted to small grating instruments for the far-infrared, sample handling techniques, assessment of instrumental performance, and wave-number calibration. The content of the remainder of the articles, as indicated by their titles, is of less general interest to chemists. In short, this is a book in which the chemist can find expert knowledge of the techniques of far-infrared and millimeter-wave spectroscopy but will obtain little indication of the kind of chemical problems for which the techniques are useful.

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Rotational Spectra and Molecular Structure. By JAMES E. WOLLRAB. Research Division, McDonnell Douglas Corporation, St. Louis, Mo. Academic Press Inc., 111 Fifth Ave., New York, N. Y. 1967. xiii + 468 pp. 16 × 23.5 cm. $20.00.

Microwave spectroscopy of gases has steadily grown in the number of its practitioners and in the range of its applications, especially to chemistry. This book will be welcomed by those who are working in this field because it is a very complete and quite thorough summary of the principal theoretical treatments needed to extract useful information from this branch of spectroscopy. Much of the contents will be relevant also to other branches of spectroscopy where rotational fine structure is resolved. There is also a chapter outlining the basic kinds of microwave spectrometers and their components. An extensive, organized bibliography and a number of useful tables add to the value of the book.

The casual reader seeking a quick idea of what the subject is about and what its main applications are may wish to turn elsewhere; this is a book with a considerable coverage of the mathematical formulas useful in interpreting spectra. On the other hand, limitations of space prevented the complete derivation of many of the equations, although the references are given.

The topics covered include the theory of the energy levels and transitions of the rigid rotor, effects of centrifugal distortion, coriolis coupling and Fermi resonance, methods of determining molecular structure from rotational spectra, theory of nuclear quadruple coupling, effect of internal rotation, inversion, and electric and magnetic fields. There are a number of appendices containing derivations of some of the formulas, an up-to-date table of barriers to internal rotation, as well as the extensive bibliography.

This book should be especially useful as a quite thorough guide to the literature and especially to the considerable literature of quantum-mechanical derivations carried out to provide the equations needed to extract molecular structures, dipole moments, force constants, nuclear field gradients, barriers to internal rotation, inversion barriers, conformations, and magnetic moments from observed microwave spectra.

The basic book of Townes and Schawlow carries an authority that is not likely to be challenged, but there has been considerable progress in the field since it was published in 1954. Therefore it is very gratifying to have an up-to-date, well-organized, and quite thorough new book made available.

Any work with as many equations as this one is bound to contain some misprints and errors and this reviewer found a few, but the number seems very acceptable.

The book is well indexed and well printed in a pleasant and readable type and format. It will surely be important to all workers in the field; the only serious regret this reviewer has is the price, which seems somewhat high.

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1,2-Cycloaddition Reactions. The Formation of Three- and Four-Membered Heterocycles. By LINDA LEE MULLER and JAN HAMER, Department of Chemistry, Tulane University, New Orleans, La. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1967. x + 362 pp. 16 × 23.5 cm. $15.00.

This Interscience monograph presents the first exhaustive survey of 1,2-cycloaddition reactions, which give rise to three- and four-

membered heterocyclic systems. The authors have reviewed the literature from the major chemical journals and *Chemical Abstracts* through the middle of 1965.

In general, the material has been organized around the ring system which is formed in the reaction. Thus, the formation of three-membered rings with only one heteroatom is considered first, followed by a systematic discussion of systems containing two heteroatoms in the three-membered ring. Heterocyclic four-membered systems are treated in similar fashion. Part I of the book is a short introduction which discusses cycloaddition reactions in general, with references to previous reviews of such reactions. In part II, the authors discuss the synthesis of heterocyclic three-membered ring systems containing one heteroatom (aziridines, aziridinium salts, aziridinones, silacyclopropanes, silirenes, germirenes, thiiranes, and thiirane 1,1-dioxides) and those containing two heteroatoms (diaziridines, diazirines, oxaziranes, and phosphiranes). Part III deals with the synthesis of heterocyclic four-membered ring systems containing one heteroatom (oxetanes, β-lactones, azetidines, 2-azetidinones, 2,4-azetidinediones, thietanes, thietane 1,1-dioxides, thietanone dioxides, and thiete 1,1-dioxides) and those containing two heteroatoms (diazetidines, diazetidinones, oxazetidines, oxathietane 1-oxides, oxathietane 1,1-dioxides, thiazetidine 1,1-dioxides, thiazetidinone 1-oxides, dithiacyclobutanes, desaurins, and 1,1-dithietenes). In addition, the final section of part III treats miscellaneous 1,2-cycloaddition reaction products such as oxadiazetidine derivatives and products of Wittig and "quasi"-Wittig-type reactions.

It should be pointed out that the authors have chosen to act as historians rather than interpreters of the published data. However, they have not hesitated to draw the reader's attention to those particularly interesting aspects of the data which should stimulate further research.

The format of the book is patterned after that of "Organic Reactions" and, as such, is quite lucid and convenient to use. The numerous tables and references provided are especially attractive. Of particular interest is the fact that the authors have included physical data on the cycloaddition products and details of the reaction conditions whenever possible.

The chief criticism of the book is that there are a considerable number of small errors which careful proofreading would have eliminated. However, in virtually every instance, these errors are so obvious as to present little likelihood of confusion. In the opinion of these reviewers, this book is a valuable contribution to the literature of cycloaddition reactions.

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