

## BOOK REVIEWS

*Circular Dichroic Spectroscopy—Exciton Coupling in Organic Stereochemistry.* NOBUYUKI HARADA and KOJI NAKANISHI. University Science Books, Mill Valley, CA 94941. 1983, xiii+460 pp. 20.5 × 23.5 cm. \$32.00.

Although the theory of optical rotation (coupled oscillator and group polarizability) was developed in the 1930s by Kuhn and Kirkwood, there still remains a large gap between empirical data and theory, a gap that is only slowly being bridged by the painstaking accumulation of experimental results and their interpretation. However, there has been an interesting development in the past fifteen years with the application of the coupled oscillator theory to the chiral through-space interaction between chromophores in the excited state. This interaction—called exciton coupling—splits the excited state into energy levels with a small energy gap  $\Delta\lambda$  called the Davydov splitting, generating Cotton effects of mutually opposite signs separated by  $\Delta\lambda$ . The summation of the two oppositely signed Cotton effects results in a net cd spectrum with two extrema of opposite signs. By convention, the longer wavelength extremum is called the first and the shorter wavelength one the second, Cotton effect. If two identical chromophores showing strong  $\pi \rightarrow \pi^*$  absorption are located in chiral positions with respect to each other, they may be depicted in a Newman projection with a certain dihedral angle between the front and rear chromophores. By convention, if the smallest dihedral angle required to go from the front to the rear chromophore is positive, this constitutes a right-handed screwness or positive exciton chirality. Non-empirical theoretical calculations have revealed that a positive exciton chirality corresponds to a positive first and negative second Cotton effect. These conclusions have been confirmed, in a number of cases, by the X-ray Bijvoet method, and, hence, the chiral exciton coupling method provides a non-empirical rule for determining absolute configuration by means of cd spectroscopy.

Although there have been numerous successful applications of the exciton coupling mechanism, there has been no systematic account of it. This book by Harada and Nakanishi gives such an account, provides a clear introduction, and describes in detail many interesting examples. The criteria that have to be satisfied for determining absolute configuration by the exciton chirality method are discussed, and then the authors turn to their own major contribution, the dibenzoate chirality rule for glycols, including glycols derived from steroids, terpenes, and other natural products. It is also shown that the method can be used for flexible compounds such as macrolides or small ring compounds, provided the conformation can be established without ambiguity. Instead of the benzoate system, the benzamide chromophore is also suitable for chiral exciton coupling and makes possible the application to 1,2-aminoalcohols and 1,2-diamines. The use of the method for polyacenes is illustrated by application to dibenz[a,h]anthracene (which possesses two naphthalene chromophores in a chiral relation), to 1,1'-bianthryl and 1,1'-binaphthyl compounds, to triptycenes, and to chiral spiranes with two aromatic chromophores.

The principle was further extended recently into systems already containing one  $\pi \rightarrow \pi^*$  chromophore (e.g., an aromatic system, a conjugated polyene, an enone, or a conjugated diene) into which an additional chromophore (e.g., benzoate) could be introduced, causing chiral exciton coupling between the two chromophores in the cd spectrum. The method is also applicable to glycols and aminoalcohols using metal chelates.

The final three chapters contain a discussion of the coupled oscillator theory, its application to the exciton chirality method, and the role of electric and magnetic transition moments. A useful Appendix summarizes the theory of optical rotatory power. Few omissions were noticed—one is the recent application (1978) of the method to the natural chiral dictyopterene (1-vinyl-2-butadienyl cyclopropane) system. The book is well written and represents a helpful reference on the theory and application of the chiral exciton coupling method. In this, it succeeds admirably and can be thoroughly recommended to anyone wishing to use this method.

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*Ethnobotany in the Neotropics.* G.T. PRANCE and J.A. KALLUNKI. New York Botanical Garden, Bronx, New York 10458. 1984, 156 pp. 17.5 × 25.5 cm. \$29.75.

*Ethnobotany in the Neotropics* represents a compilation of ten papers presented at an "Ethnobotany in the Neotropics Symposium" held at the Annual Meeting of the Society for Economic Botany, June 13-14, 1983, at Oxford, Ohio. This reviewer attended that symposium and found it to be the most informative and exciting scientific meeting that he has ever attended. The papers of this book attest to that opinion.

Chapters included in the book are as follows: Notes on Some Medicinal and Poisonous Plants of Amazonian Peru, F. Ayala Flores; Ethnobotany of Palms in the Neotropics, M.J. Balick; Contributions of Native American Collectors to the Ethnobotany of the Neotropics, J.S. Boster; The Ethnobotany of the Neotropical Solanaceae, C.B. Heiser, Jr.; Plants and Dental Care among the Jivaro of the Upper Amazon Basin, W.H. Lewis and M.P.F. Elvin-Lewis; The Ethnobotany of Coca (*Erythroxylum* spp., Erythroxylaceae), T. Plowman; A Preliminary Report on Diversified Management of Tropical Forest by the Kayapó Indians of the Brazilian Amazon, D.A. Posey; The Use of Edible Fungi by Amazonian Indians, G.T. Prance; and Ver-o-Peso: The Ethnobotany of an Amazonian Market, M.E. van den Berg.

Needless to say, the titles of these chapters are self-explanatory. What is important is that each chapter identified a treasure chest of new leads that should be experimentally studied from chemical and pharmacological viewpoints.

The book is printed on excellent paper and is virtually free from error. It is a bargain at the quoted price and should be of great interest to graduate students and scientists interested in all aspects of the economic value of plants. It is also recommended for all libraries and industrial firms interested in economic plants, especially those with medicinal potential.

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Continued from back cover

BRIEF REPORTS

|  |     |
|--|-----|
| Flavonoids from <i>Berlandiera texana</i> var. <i>texana</i> —Zofia Bulinska-Radomska, J.A. Norris, D.A. Hosage, and T.J. Mabry  | 667 |
| 6-Methoxyflavonoids of <i>Brickellia monocephala</i> —John A. Norris and Tom J. Mabry  | 668 |
| Additional Alkaloids of <i>Thalictrum javanicum</i> —Mabendra Sabai, S.C. Sinha, Anil B. Ray, Sunil K. Chattopadhyay, Suleiman Al-Khalil, David J. Slatkin, and Paul L. Schiff, Jr.                                    | 669 |
| Turkish Species of <i>Fumaria</i> and Their Alkaloids, V. Alkaloids from <i>Fumaria capreolata</i> and <i>Fumaria asepalae</i> —Bilge Şener  | 670 |
| Bisbenzylisoquinoline Alkaloids of <i>Laurelia sempervirens</i> —Bruce K. Cassels and Alejandro Urzúa  | 671 |
| Alkaloids of Anatolian <i>Thalictrum sultanabadense</i> —Kemal Hüsnü Can Başer, Muzaffer Ögütveren, and Norman G. Bisset   | 672 |
| The Volatile Leaf Oils of Two Rare Junipers from Western Mexico: <i>Juniperus durangensis</i> and <i>Juniperus jaliscana</i> —Robert P. Adams, Thomas A. Zanoni, and Lawrence Hogge                                    | 673 |
| C-Glycosylflavones from <i>Monnina trifolia</i> —A. Keita, J. Gley, E. Stanislas, and I. Fouraste  | 675 |
| Diterpenes from <i>Viguiera porteri</i> —Werner Herz and Palaniappan Kulanthaiavel   | 676 |
| The Volatile Leaf Oils of the Junipers of Guatemala and Chiapas, Mexico: <i>Juniperus comitana</i> , <i>Juniperus gamboana</i> , and <i>Juniperus standleyi</i> —Robert P. Adams, Thomas A. Zanoni, and Lawrence Hogge | 678 |
| Constituents from <i>Chrysactinia mexicana</i> —X.A. Dominguez, G. Vazquez, and R.N. Baruah  | 681 |
| Constituents of the Bark of <i>Euptelea polyandra</i> —Takao Konoshima, Takatsugu Matsuda, Midori Takasaki, Jobji Yamahara, Mutsuo Kozuka, Tokunosuke Sawada, and Teturo Shingu  | 683 |
| Studies in the Thymelaeaceae III. Constituents of <i>Gyrinops walla</i> —Yeh Schun and Geoffrey A. Cordell   | 684 |
| Book Reviews   | 686 |
| The American Society of Pharmacognosy New Research Awards Program  | 688 |