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Book review

"Principles of Ultraviolet Photoelectron Spectroscopy",
J. W. Rabalais, John Wiley and Sons, New York/London/Sydney/Toronto,
1976, xv + 454 pages, $29.95.

This latest monograph on photoelectron spectroscopy is a useful addition to the existing books on the topic. Written by a person of distinct physical bent, it successfully bridges the gap between the quantum mechanics of photoionization and the crude but well used models of the descriptive chemist. The volume has less of a monographic air about it than previous works and gives a comprehensive treatment of the photoejection of electrons from gas phase species at photon energies less than 41 eV. After an introductory chapter, the next nine chapters are devoted to a detailed treatment of photoionization including experimental techniques, quantum chemical models, ionization of closed and open-shell species, cross sections, angular distributions, spin-orbit coupling, structural changes accompanying ionization and empirical models for the interpretation of spectra. The treatment is basically descriptive (although there is plenty of theory for a person of my interests) and numerous examples, including metals and non-metals, are used to good effect. The highlights are the treatment of molecular orbitals vs equivalent orbitals, a discussion of relative cross sections as a function of energy, and a nice presentation of empirical models such as the molecules-in-molecules model. The book concludes with a rather shallow (20 pages) chapter on applications of this technique. It

is true that numerous examples of applications appear in the main portion of the book; that many areas of application, e.g., high temperature molecules, are rather immature, and that a complete discussion is outside the stated scope of the book. On the other hand, in at least one instance this superficial treatment has, at best, resulted in an incomplete picture. The relatively extensive discussion of a single work concerning the interpretation of the spectra of XY_4 molecules (X = C, Si, Ge, Sn, Pb; Y = F, CH_3) in terms of d orbital participation in bonding is presented without giving the cogent opposing viewpoint (M. B. Hall et al., J. Electron Spectr., 1, 497 (1972) and more recently, D. R. Lloyd and D. J. Roberts, ibid., 7, 325 (1975)). The book concludes with a set of appendices including among other things a very useful compilation of species for which spectra have been reported for the period up to early 1975. (Curiously enough the Hall et al. reference is included.) Despite some flaws the book will have many readers, simply because it does a good job of presenting a working knowledge of the principles underlying valence level photoelectron spectroscopy. It is recommended as a useful addition to the library of anyone evaluating the potential use of the technique in a particular area of chemistry.

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