associates over the last decade.

Hoffmann's discussion is charming and highly readable. His students have evidently found the formalism and language of energy band theory, as practiced by physicists, a serious stumbling block, and he devotes most of the book to translating band results into Huckel language. For those who share his convictions about the universal significance of the Huckel approach this book should prove highly rewarding.

But what about the results? Here Hoffmann and his collaborators have fared poorly, and their published research papers overall show very little agreement with experiment. In contrast, by now quite a number of theoretical physicists have derived results which not only agree with experiment (to within 0.1 eV on electronic energy levels, for example, which is some 10 to 20 times better accuracy than Hoffmann gets), but in many cases where the experiments were difficult, actually predicted results which were later confirmed experimentally.

Does your theoretical success in staying in contact with the cutting-edge of experiment affect your pedagogy? Evidently. Hoffmann correctly identifies CO on Ni as a prototypical example of chemisorption on surfaces. But when he comes to discuss bonding in solids, the *only* examples he selects are decidedly arcane: ternary transition metal compounds such as $ThCr_2Si_2$ or $Na_3Fe_2S_4$. Nowhere do we see anything about the most studied and best understood elemental and binary solids, such as Si, Ge, GaAs, W, transition metal silicides, and so on. Considering the pedagogical nature of this book, it is hard to justify this curious selection of subjects.

The practicing materials scientist will be disappointed by the omission from this book of any mention of empirical methods other than the Huckel method, such as Miedema's approach to intermetallic compounds, which predicts surface segregation in intermetallic alloys. In The Merry Widow we learn that "das studium der weiber ist schwer." So is materials science.

Reviewer: J.C. Phillips, a freelance theorist is a senior member of the technical staff at AT&T Bell Laboratories, Murray Hill, New Jersey. He recently wrote The Physics of High-T_c Superconductors *(Academic Press, Boston, 1989).*

Introduction to Quasicrystals

Edited by M.V. Jaric

Academic Press, 1988

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Introduction to Quasicrystals is the first volume in a series from Academic Press titled "Aperiodicity and Order." The book contains six chapters by authors who, for the most part, have been active in quasicrystal research since the first icosahedral phases were discovered in 1984. The articles are clearly written and provide an overview of the field useful to students and researchers alike.

The two opening articles emphasize the role that local icosahedral order plays in metallic crystals and glasses. Chapter one, by David and Clara Shoemaker, enumerates the possibilities of icosahedral ordering and icosahedral networks in complex alloys. Most of the article is devoted to a catalogue of examples drawn from the authors' long experience with the structure of intermetallic compounds. There is perhaps a bit too much detail for the casual reader, but it serves to illustrate the point of the article, namely that an understanding of the icosahedral arrangements of atoms found in complex intermetallic alloys can be a useful aid in unraveling the atomic structure of icosahedral quasicrystals.

The notion of frustration in icosahedral systems and its analysis through the study of polytopes in curved space, briefly mentioned in the first chapter, are the focus of the second chapter by Michael Widom. Widom begins with a general discussion of local icosahedral ordering in atomic clusters, liquids, and glasses. After introducing the mathematics of polytopes, he describes how glasses, icosahedrally coordinated crystals and quasicrystals may be generated by different procedures for flattening the polytopes from curved to Euclidian space. The chapter is a precis for much of the thinking on frustrated icosahedral order in condensed matter up to the time of Schectman's discovery of icosahedral AlMn.

The metallurgy of icosahedral and decagonal quasicrystals is the topic of the next chapter by Robert Schaefer and Leonid Bendersky. Emphasizing work on AlMn and AlCuLi phases, the authors do a sensible job of pulling together disparate information on the stability, formation, thermodynamics, and orientation relationships of these and other phases.

The final three chapters deal with theoretical questions of quasicrystals. The fourth chapter, by Per Bak and Alan Goldman, discusses quasicrystals and other incommensurate structures as projections of higher dimensional periodic structures. Aspects of higher dimensional crystallography are also addressed. The issue of stability is treated in the next chapter by Ofer Biham, David Mukamel and S. Shtrikman. The authors adopt a Landau theory approach, but also include results from numerical simulations. They conclude with an interesting discussion of stability in the presence of small elastic deformations and the possibility of lock-in transitions.

The last chapter, by Tom Lubensky, is a careful introduction to the elasticity and hydrodynamics (long wavelength dynamics) of quasiperiodic structures. Although rather long (it comprises one third of the book), the article is quite readable and strikes a good balance between general theoretical considerations of quasiperiodic structures and specific results for icosahedral quasicrystals. The article includes a discussion of phasons in quasicrystals (also addressed in chapter four), treating both phason dynamics and static disorder in the form of quenched phason strains.

On the whole the book provides much useful information; I recommend it for anyone seriously involved in quasicrystal research and, generally, as a worthwhile addition to research libraries serving physicists and materials scientists. A regrettable flaw of the book is the lack of an adequate introduction which could have served to tie together the separate articles, give the reader a broad sense of where the field is going and fill several gaps in the presentation. For example, a brief review of the experimental status of the field, as well as some mention of competing models, would have helped orient the newcomer to the field.

Reviewer: Peter A. Bancel is a postdoctoral laboratory employee at IBM T.J. Watson Research Center. His research is in quasicrystals.

ERRATA:

The photo published on p. 47 of the December 1989 *MRS BULLETIN* was that of Robert A. Frosch and not that of D. Allan Bromley.