tals of optical and infrared detection in terms of the behavior of the radiation field, the physical properties of the detector and the statistical behavior of the detector output."

The book begins with the derivation of the Planck radiation law. It covers ideal photon detectors, thermal detection processes and heterodyne detection and various applications such as radiometry, stellar interferometry and laser radar. While Kingston does not specifically cover detector materials, he discusses in detail photoconductors, photodiodes and avalanche photodiodes. By using material parameters for HeCdTe, as an example, he employs the formulation he has developed to calculate the device characteristics. He uses a similar treatment for thermal detectors, where he treats the most common types: bolometers and pyroelectric detectors. The detection of radiation requires an understanding not only of the source of radiation and the detector but also of the medium between the two. With that in mind, there is a chapter on atmospheric limitations with emphasis on turbulence.

Perhaps another author might have stressed different topics or given more detail on the experimental techniques and equipment. There is no doubt, however, that this book meets a real need. One can hope that it may spawn courses at a number of universities where this book might be used as a text, or that this text might lead to others using different approaches.

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Induced Representations in Crystals and Molecules: Point, Space and Nonrigid Molecule Groups

S. L. Altmann
369 pp. Academic, New York, 1977. $35.25

A representation of a group may be created or induced from a representation of a subgroup. Induced-representation techniques are a standard part of most introductory texts on group theory and a very useful tool in applications of the theory of groups to physical problems. To show that an induced representation is irreducible can be a tedious or difficult task.

In the early 1950's George Mackey proved a series of powerful theorems elucidating the properties of induced representations. Mackey's work in turn has stimulated applications and extensions in many areas of theoretical physics including the book that is the subject of this review. Indeed, the heart of the theoretical development of Simon L. Altmann's *Induced Representations in Crystals and Molecules* is chapters 13 through 16. This section begins with a theorem credited to Mackey, but specialized for finite groups by Christopher J. Bradley. Mackey's theorem and its extensions lend a laudable elegance and economy to the theoretical development and in this respect do provide fresh insight into group structures. Judging from Altmann's book, however, the promise of significant new results stimulated by Mackey's work remains unfulfilled. The induced representation language has not produced any general theoretical results unobtainable in other ways.

Induced Representations in Crystals and Molecules is an advanced group-theory text intended for graduate students and researchers in solid-state physics and theoretical chemistry. The organization of the material and the manner of presentation benefit from Altmann's experience in lecturing to various groups. It is not a book for novices in group theory. The novice will find little to help him understand where a

given topic fits into the whole and no exercises to develop a feeling for the abstract ideas in a concrete context. Even the introductory chapters 1 through 12, which survey the basic definitions and the results of group theory, are presented at a sophisticated level.

Altmann's thrust is toward being clear, coherent and concise. For the most part he succeeds. The theoretical development in chapters 1 through 16 occupy a little more than half the book. Altmann discusses generally applications to space groups (chapter 17) and selection rules in crystals (chapter 18) and exemplifies them by the hexagonal close-packed space group. The concluding chapters 19 and 20 reflect Altmann's research interest in nonrigid molecules. He lays the groundwork for treating molecular groups efficiently in chapter 19 with an extensive discussion leading to the reduction of semidirect products. For the physicist whose object is to apply group-theoretic methods to a particular system, this chapter is the most practically useful part of the book. Chapter 20 introduces the subject of symmetry in nonrigid molecules and uses the group of the boron-trimethyl molecule (a group of order 324) as an example.

Altmann does make a real effort to help his reader. A preliminary chapter 0 summarizes the notation used in the book. Altmann precedes each chapter with a brief introductory remark stating its purpose and describing the organization of the material. I recommend you peruse these chapter headings before seriously attacking the book. Besides giving an overview of the content and organization of the book, it may save time by allowing a more selective reading. For example, if the objective is to learn about the applications of group theory to space groups (chapter 17), the introductory remarks reveal that the immediately preceeding chapters are the crucial ones. A scan of chapter 17 will find that the Herring method of finding the irreducible representations of nonsymmorphic space groups for k-vectors on the Brillouin-zone face is the main calculational tool employed; the lengthy chapter 6 on projective representations finds no essential application here.

Another way in which Altmann helps his reader is to provide a compact and efficient referral system that helps one to follow the proofs of the theorems. At first glance one might conclude that someone had cleverly substituted Altmann's proofs with some random selections from an alien computer source language. In fact, Altmann precedes each equation in a proof with a little cluster of symbols that, upon decoding (see Chapter 0), tells from where the equation came or how to derive it. For more subtle steps, a footnote elaborates on the subtlety or warns of possible pitfalls for the unwary. The system should be of enormous help to the reader who starts in the middle. Detailed examples, included in most chapters to illustrate the concepts introduced in the chapter, may also help the reader.

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Particles, Nuclei and High-Energy Physics

Relativistische Quantenfeldtheorie (Hochschultaschenbücher, Band 101). J. D. Bjorken, S. D. Drell. 409 pp. Bibliographisches Institut, Mannheim, W. Germany, n.d. (English edition, 1965). (Price not stated)

Physik für Naturwissenschaftler III: Atomphysik, Kernphysik (Hochschultaschenbücher, Band 729). H. Nevert. 323 pp. Bibliographisches Institut, Mannheim, W. Germany, 1978. (Price not stated)