per on the interpretation of electrical potential measurements across the monolayer.

Coverage of novel experimental techniques includes a discussion of a dynamic technique for obtaining surface-elasticity-versus-surface-pressure curves, which can be transformed into accurate pressure-area curves for soluble monolayers. Three papers cover spin labeling for probing molecular motion in monomolecular arrays, and one paper presents electron microscopic observations of transferred films. Two studies of monolayers of macromolecules are presented, and one of these has provided the picture on the cover of the book.

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## Accelerated Ion Beams

**New Uses of Ion Accelerators.** JAMES F. ZIEGLER, Ed. Plenum, New York, 1975. xiv, 482 pp., illus. $28.

The casual reader may be a little surprised that there are enough "new uses" of ion accelerators to fill a book, since ion accelerators have been around such a long time. Scientists familiar with some of the recent applications of accelerated ion beams, on the other hand, may marvel at an attempt to address this rapidly expanding field in only one book. At the present time there are at least four continuing international conferences and one series of Gordon Conferences devoted just to the research activities in these areas; many established disciplines are including symposiums on ion beams in their own meetings because of their relevance in their fields; roughly a score of books, conference proceedings, and review articles have been published on the subject in recent years; and ion implantation, sputtering, and ion bombardment have achieved such acceptance in industrial processing that most low energy accelerators are now sold to industry. Obviously, in the face of such odds, one must concede from the outset that thorough coverage in a single volume is not possible and look instead to the quality of selection.

Considering the magnitude of the task, *New Uses of Ion Accelerators* does a creditable job of illustrating the remarkable versatility of accelerated ion beams as tools for altering materials properties and for fundamental analysis. The book is a collaborative effort with contributions from 13 authors, so it inevitably lacks continuity. Concomitantly, it is the diversity of expertise that is largely responsible for the success of the book. Almost without exception, the authors have treated their various specialties with the cognizance that their readers are likely to come from a wide range of disciplines. The subjects covered are ion-induced x-rays in gases and solids, materials analysis by nuclear backscattering and nuclear reactions, lattice location of impurity atoms in metals and semiconductors utilizing the channeling technique, and ion implantation in metals and superconductors (which is misprinted as "semiconductors" in the book).

The most frequent criticism of recent articles treating materials analysis by nuclear backscattering and nuclear reactions has been that these are among the oldest and best understood effects in physics and efforts in this direction are a little like rediscovering the wheel. In defense of this book's sections on backscattering and nuclear reactions, it may be said that the authors have imparted an orderliness and convenience to the utilization of these effects for materials analysis that is elegant in its completeness. All the pertinent physical considerations, pitfalls, and sensitivities of the technique are brought into focus in two concise chapters. This treatment makes utilization painless for either the beginner or the veteran. The three chapters on ion-induced x-rays are excellent. The chapter on lattice locations of impurities in metals and semiconductors is probably the clearest review of this field to date. The two chapters on ion implantation in metals and superconductors are good, complementary additions to this huge field because they provide coverage of areas not emphasized in previous books.

The main thing that recommends this book is that it is timely; it deals with a type of research that is on the rise. In a sense this is a tribute to the years of basic research and development in low energy nuclear physics. It is the low energy accelerators, ion sources, electronics, improved particle and x-ray detectors, and high vacuum technology pioneered in nuclear physics that make the uses discussed above possible. The most obvious impact of these advances so far has been on the field of ion implantation. Early basic investigations in radiation damage and channeling provided the impetus for ion implantation investigations, which in turn had a revolutionary effect on device fabrication in the semiconductor industry. Similarly, many of the applications of ion beams discussed in this book are certain to expand and some to spawn other fields.

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*(Continued on page 322)*