In the final chapter the review of the methods for abundance determination is straightforward, but again only summarizes the approaches. The discussion of derived stellar abundances and correlation with age and location is stimulating and should suggest to the young researcher a fertile field for research.

The overall reaction to the book is that the reader cannot fail to leave it without a head full of new ideas; it should be particularly valuable to graduate students, but even the established observational spectroscopists should include this work in their libraries.

K. M. YOSS
University of Illinois Observatory, Urbana

A Kind of Microscope

Field Ion Microscopy. Principles and Applications. ERWIN W. MÜLLER and TIEN TZOU TSONG. Elsevier, New York, 1969. x, 314 pp., illus. $19.

"The fascination of field ion microscopy lies in the immediacy of the encounter with the individual atoms making up the real surface structure of solids. The uniquely powerful field ion microscope is so basically simple that it is hard to understand why . . . its acceptance as a research tool required a relatively long initiation period." To the first of the authors of this text, Erwin Müller, goes the honor of inventing what is, at one and the same time, both the simplest and the most powerful microscope. To see atoms with a microscope (containing neither lenses nor light source!) that is well within the constructional skill of a junior high school science club bespeaks an unusual elegance of conception. It is indeed pertinent to ask why the field ion microscope remains, even today, a fascinating demonstration of crystal regularity rather than a powerful research tool comparable to the electron microscope or the x-ray diffraction camera.

Müller's contribution to field ion microscopy extends far beyond the accident of invention, and his innovations range from the initial discovery of the technique, in 1951, through the introduction of cryogenic techniques (1956), to image intensification (1963) and, finally, the atom probe for detecting and identifying individual atoms (1968). The present text is the long-awaited summary of all work up to September 1969 on field ion microscopy. That the emphasis is on the research carried out by Müller's laboratory, at Pennsylvania State University, is more a reflection of the vast volume of results produced by this one laboratory rather than of any bias on the part of the authors. Indeed, they have taken pains to include any and all work from every source, and have been most critical of their own published papers and perhaps a little too kind in evaluating the work of others.

The authors go a long way toward explaining just why the simplicity of field ion microscopy is largely deceptive, and the reader with a background in modern physics may be forgiven for some astonishment at the naivety of much of the past thinking in this field. Explanations for the basic processes of field ionization, field evaporation, and field etching remain unsatisfyingly crude, and the good agreement with experiment seems unconvincingly fortuitous. Much the same can be said for the calculation of image intensity, contrast, and resolution.

The present text emphasizes experimental research on the field ion microscope itself, and by contrast the section on applications makes unsatisfactory reading. The reason for this dissatisfaction lies in the relative rarity of attempts to use field ion microscopy as a tool to solve a particular research problem or to provide basically original information. Instead, the known structure, properties, and history of the specimen are repeatedly invoked by the authors to explain, for the most part qualitatively, details of image contrast, and the reader is left with the impression that this correlation process is regarded as the end product and satisfactory conclusion of a field ion microscope investigation. In summary, this book is now the definitive text on the principles of field ion microscopy, but the microscopist will find little here to convince him that this technique can ever become a routine research tool.

D. G. BRANDON
Department of Materials Engineering, Technion, Haifa, Israel

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