

tainly not suited for a one-semester survey course on nuclear physics. (There is just too much that is of interest in modern nuclear physics that is not covered here.) However, the rigorous introduction to the properties and decays of nuclei provided by this text should be a very strong and very useful foundation for a subsequent semester on nuclear models and reaction mechanisms.

Finally, I would like to commend the author for his choice of modern, up-to-date (mostly late 1960's and 1970's) references and experimental data for examples and illustrations in his text.

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Introduction to Electron and Ion Optics

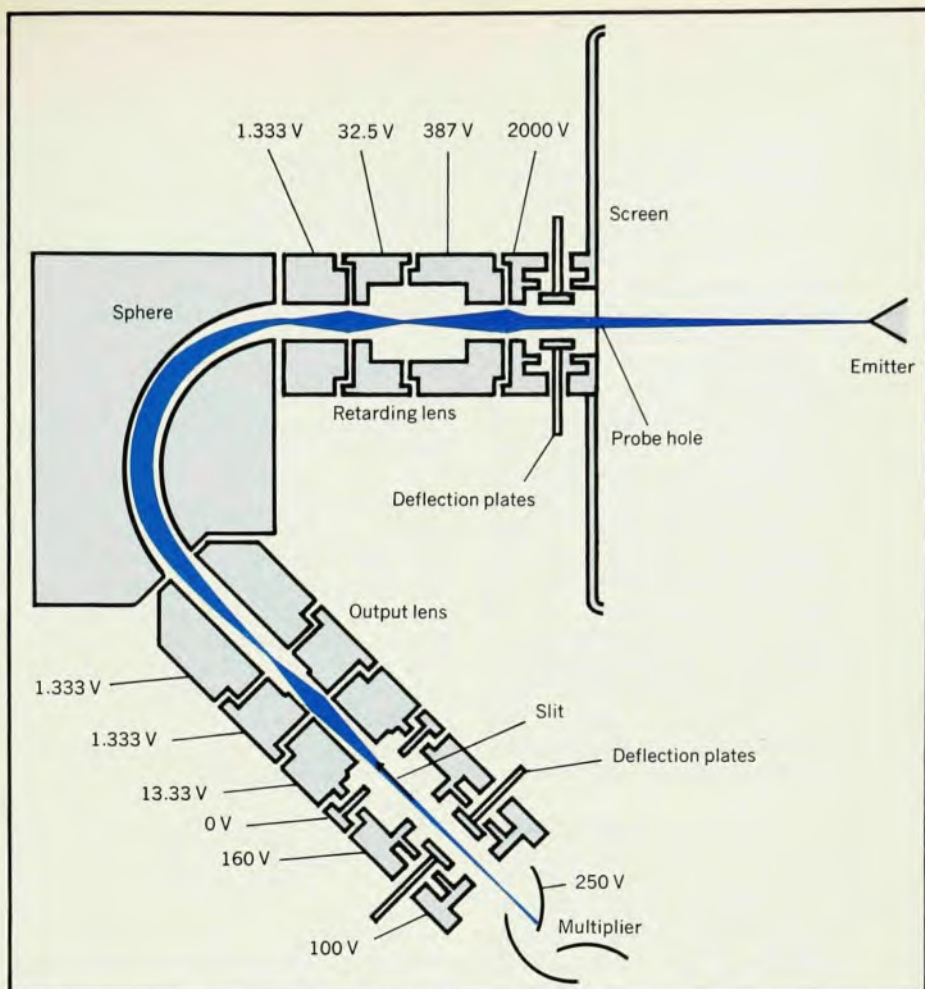
Poul Dahl
147 pp. Academic, New York, 1973.
\$10.50

The development of improved devices for producing beams of charged particles, especially low-energy monoenergetic beams, and in energy-analyzing such beams, has produced significant advances in electron- and ion-scattering measurements and in surface analytic instruments such as ESCA (x-ray photoelectron spectroscopy). These developments have benefited from, and in turn inspired, corresponding developments in charged-particle optics.

This small book gives a good introduction to electron and ion optics that is suitable either for an introductory course (a set of problems is included but no solutions provided) or as a jumping-off point for those who would delve seriously into electron/ion optical design. Being an introduction, the book does not bring the reader up-to-date on the important literature of the field nor does it give much information on how to go about designing lens systems for beam formation and beam transport. Nevertheless, the book contains much that the serious user of charged-particle optics must know, and that is not contained in other books.

In his treatment of electrostatic and magnetic lenses and analyzers Poul Dahl consistently uses a matrix formulation. Such matrices are very useful—I have used them for many years both in hand and computer calculations. Dahl treats lenses primarily to the first order together with a very brief description of third-order aberrations. He gives data for only one electrostatic lens, and these data are of poor quality compared to what is recently available.

The very important concept of beam



This field-emission electron energy analyzer has a resolution of 20 meV for electrons of 2000 eV. From C. E. Kuyatt and E. W. Plummer, *Rev. Sci. Instr.* **43**, 108 (1972).

emittance is employed to describe the structure of a beam of particles and is used consistently in the treatment of particle analyzers and particle sources. He does clearly explain the conservation of emittance and the use of emittance diagrams.

Perhaps the strongest attribute of the book is its extensive discussion of charged-particle analyzers—both electrostatic and magnetic. Dahl discusses the properties of many types of analyzers together with a very clear exposition of the effect of source emittance on the resolving power and transmission. He shows that preretardation can increase either the resolving power or the source emittance, a concept that has been much used in practice but finds its way into a book on charged-particle optics here for the first time.

The book closes with a useful discussion of the effects of space charge on beam formation and transport, both for flat and round beams. The author correctly points out that to form space-charge limited beams it is often necessary to decelerate a beam formed at a higher energy.

Despite its omissions, there is enough good material in the book to merit its purchase by anyone with a se-

rious interest in charged-particle optics.

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Nuclear Research Emulsions II: Particle Behavior and Emulsion Applications

W. H. Barkas
462 pp. Academic, New York, 1973.
\$36.00

At last, the second volume of the treatise on nuclear research emulsions by the late Walter Barkas (heralded on the fly-cover of the first volume published in 1963) has appeared. Although the appearance of the book is undoubtedly belated, it does present to the reader a detailed and authoritative account of the many uses to which nuclear emulsions have been put in physics, and other subjects too, by a man who was among the leading protagonists of the nuclear-emulsion technique as a very accurate and quantitative in-