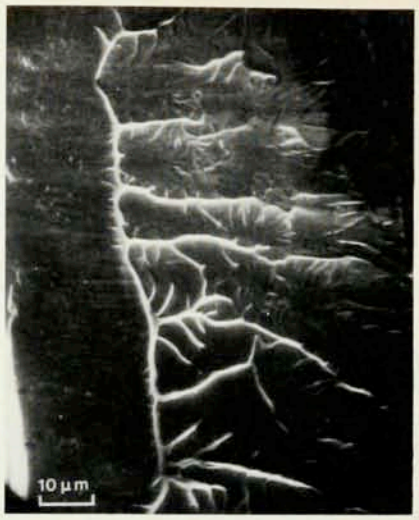

Scanning electron micrograph of the fracture surface of an amorphous metal ribbon broken in the ductile fracture mode. The illustration appears with an article on metallic glasses in the *Encyclopedia of Materials Science and Engineering*, reviewed here.

also varies widely. The article on acoustic microscopy, for example, uses photographs and block diagrams to excellent effect, but many other articles contain neither photographs nor graphics, and highly limited standard reference data—if any at all. While such deficiencies are natural characteristics of youth rather than fatal flaws in the product, they detract from the encyclopedia's usefulness to the various specialized constituencies it might serve; the serious contributors will thus probably lose readership because of their less conscientious colleagues.

The editor in chief envisages that the encyclopedia "will serve the needs of faculty members, researchers and students in academic institutions and of researchers, engineers and managers in industry. It should . . . be valuable to any organization with a professional interest in materials, as well as to individuals pursuing independent studies." To the extent that it is used as a supplementary source defining the broad scope and coverage of the field, I would agree. As a general reference on the nature of materials science and engineering this encyclopedia is unsurpassed. As a specialized reference source on specific topics, however, the lack of uniformity of coverage, the absence of comprehensive tabulations of standard reference data, and the sometimes parochial references to the literature render these volumes seriously flawed. In my opinion, considerable improvements in subsequent editions of this encyclopedia are required before it reaches the standards defined by the two comparable chemistry and chemical engineering encyclopedias.

Books are expensive—increasingly so in recent years. Thus any new reference must justify its place in the collections of both individuals and institutions. At a cost of approximately $250.00 a volume, the *Encyclopedia of Materials Science and Engineering* is clearly beyond the means of any but the most affluent individual professional. It is most suitable for a collection whose audience requires a broad yet detailed knowledge of the field. Certainly it should be included in research libraries at institutions specializing in some aspect of materials science such as industrial laboratories and university materials research programs. The high cost and the lack of uniform coverage will limit this work's attractiveness for general library collections and specialized research groups, respectively. Above all, these volumes are historically significant. Since their appearance marks the emergence of materials science and engineering as an independent field of endeavor, they constitute important reference works for future historians of science.

Supermanifolds

Bryce de Witt
316 pp. Cambridge U. P., New York, 1984. $59.50

By now a number of books and monographs have appeared discussing various aspects of the subject that we may justifiably term "super" mathematics. *Supermanifolds* by Bryce de Witt is a welcome addition to the field, being a tightly focussed and very useful exposition of the mathematical tools and techniques used in the field.

The reader should not expect to learn differential geometry, Lie algebra, or even space–time supersymmetry from this book, as de Witt has written this book for a mathematically and physically sophisticated audience. For the practitioner in the field, however, this book provides a delightful and unique *tour de force* as it carefully exhibits the mathematical structure of supermathematics. Starting from a simple beginning discussing the supercomplex numbers, the book then parallels the usual technical discussions of ordinary differential geometry. The book provides a very detailed and readable guide to subjects such as superanalyticity, supervector spaces, supermanifolds, superforms, super Lie groups, and super Lie algebras. The book is then rounded out with a number of elementary applications: the Bose and Fermi oscillators and supersymmetric quantum mechanics.

The author has performed a very

useful service by concentrating on the mathematical underpinnings of supermathematics, and making a good job of the exposition. There are a number of other books available that give adequate coverage of field-theoretical supersymmetries and the supergravities; this book does not attempt to duplicate such coverage. I would expect this book to be most useful for mathematicians interested in an introduction to the field, for graduate students who already know the relevant "non-super" mathematics, or as a reference for physicists already acquainted with the field.

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Random Walks in Biology

Howard C. Berg
144 pp. Princeton U. P., Princeton, 1983. $16.50

This is an attractive little book. It is an elementary exposition of the theory of random motions, written for biologists and biochemists. Random motions are important in biology on two levels. On the level of molecules, random motions are essential to give every molecule in a cell a chance to encounter every other molecule. Only because of the high speed of molecular diffusion over short distances is it possible for a few molecules of DNA to organize the entire metabolism of a cell. On the level of organisms, random motions are essential in enabling cells to find food. Only because of the efficiency of cellular chemotaxis over short distances is it possible for a sperm cell to find an egg.

The classic reference in this field is a talk given by Edward Purcell with the title "Life at Low Reynolds Number" and published in the *American Journal of Physics* in January 1977. Purcell summarized in eight scintillating pages the phenomenology of fluid motions as they are experienced and manipulated by small creatures. If you read Purcell's talk, you will see that he gives credit for all the main ideas and discoveries to Howard Berg. In particular, it was Berg who deduced from the observed motions of bacteria that they must swim by rotating their flagella like the propellors of a ship and not by waving their flagella around like oars. This deduction was later proved correct by direct experiment.

Here we have Berg speaking for himself. A large part of his book is an expanded version of Purcell's talk, with the colorful language replaced by exact analysis: Berg provides the detailed statistical theory and the mathematical equations to justify Purcell's arguments. The book will be useful to biologists and biochemists who want to