groups will find their needs met by the extensive coverage provided in this latest and most up-to-date volume on the subject.

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## Understanding Materials Science: History, Properties, Applications

Rolf E. Hummel
*Springer-Verlag, New York, 1998.*
*407 pp. $59.95 hc*
*ISBN 0-387-98303-1*

Although materials have always played an important role in society, few books have presented the story for a general audience. Rolf Hummel, in his *Understanding Materials Science: History, Properties, Applications*, attempts to provide an introduction to the history, uses and development of materials for students of engineering and physics as well as the general public. The book holds a special interest for me as a result of my own efforts to present, as part of a public television series, the results of research in our laboratories at the University of California, Santa Barbara, and my subsequent development of a general-education undergraduate course on materials and society.

Hummel, a professor of materials science at the University of Florida, has previously written books on the optical properties of metals and alloys and on electro- and thermotransport in metals and alloys. More recently, he wrote a successful senior-level textbook for engineering students on the electronic properties of materials. In his new book, he provides a more general presentation of a wider array of subjects and relates them to their history and applications.

There is a real need for books like this, since a visit to any large bookstore will reveal very few popular science books that deal with the practical impacts of the enormous materials revolution that has defined and enabled our present technological era. Hummel tries—and succeeds—to relate the historical developments in the various materials eras (stone, bronze, iron and electronic) to the principal defining features of the various classes of materials. He interleaves short chapters on the historical development of mechanical and electrical materials with longer, but relatively simple and easy to understand, descriptions of the basic physics and chemistry of the various classes of materials.

The treatments roughly parallel the approaches normally taught in a one-semester course on materials. They include quantitative discussions and presentation of the key equations. Each chapter on mechanical and electronic materials concludes with problems, most of which require basic calculations. The chapters on ceramics and polymers are less quantitative than the others and are interwoven more closely with the historical descriptions; these chapters are centered around applications in pottery, glass, fibers and plastic, which will interest the more general reader.

Among the other books that attempt elementary descriptions of the fundamentals and applications of materials and materials science, Peter Thrower's admirable textbook *Materials in Today's World* (McGraw Hill, 1996) is aimed at a more general and less technical audience. Thrower's book is based on an innovative and popular general-education course on materials that he developed at Pennsylvania State University and that currently attracts 2000 students each year. The Hummel book is thinner, less detailed and less quantitative than the more standard undergraduate texts for materials science and engineering students, such as William Callister's *Materials Science and Engineering* (Wiley, 1994) or Donald Askeland's *Science and Engineering of Materials* (PWS Publishing, 1994). But Hummel's book covers the same main ideas as the more complete texts.

A wonderful supplement to these texts is John Russ's *Materials Science, A Multimedia Approach* CD-ROM, (PWS Publishing, 1996), which Russ and his students developed at North Carolina State University. This is a series of over 600 illustrations, animations, explanations and tests designed to accompany the traditional texts. It offers a marvelous and creative way to visualize and learn the key concepts and background of materials and calls for lots of student input.

An additional aspect of materials that is nicely covered in Hummel's book is the environmental and economic implications of society's use of materials. The discussions of world resources, the remaining supply of various materials and the fundamentals underlying waste disposal and recycling will be fascinating to both the science student and the general reader. These important areas of science are strong motivators for the wider study of science and technology by the larger public.

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## Advanced Stellar Astrophysics

William K. Rose
*Cambridge U. P., New York, 1998.*
*480 pp. $80.00 hc ($34.95 pb)*
*ISBN 0-521-58188-5 hc*
*(0-521-58833-2 pb)*

Because of the limited market for graduate texts in astrophysics, few are produced, and any new addition is always greeted with enthusiasm. But when I read the promotional material for William K. Rose's *Advanced Stellar Astrophysics*, indicating that this was "the first advanced textbook on stellar astrophysics in nearly three decades," it dampened my enthusiasm. Perhaps it was a marketing ploy to overlook such venerable texts as *Stellar Atmospheres* by Dimitri Mihalas (W. H. Freeman, 1978), *Stellar Structure and Evolution* by Rudolf Kippenhahn and Alfred Weigert (Springer-Verlag, 1990), the three-volume *Introduction to Stellar Astrophysics* by Erika Böhm-Vitense (Cambridge U. P., 1989/1992), or my own *Fundamentals of Stellar Astrophysics* (W. H. Freeman, 1989). Unfortunately, the lack of references to them and other, even if older, standards in the field, such as *Principles of Stellar Structure* by John Cox and R. Thomas Giuli (Gordon & Breach, 1968), left me to assume that the author was simply unfamiliar with the literature. While overlooking important references is a serious flaw in any textbook, a very lucid presentation of the material can be a compensation.

Unfortunately, Rose provides no unifying theme to which students can fit the details of the subject matter and from which they can obtain an ordered, comprehensive picture of the subject. Rather, the book is a heterogeneous collection of topics presented in no apparent order. Compared to treatments found in the above texts, most of the topics are dealt with too cursorily and simplistically.

Far too often phrases such as "it can be shown . . ." appear in this book. A compressed and often naive treatment of a collection of topics is the book's hallmark. For example, in his three-page discussion of stellar rotation, the author spends a page and a half on the proof of what is generally known as the Taylor–Proudman theorem and then moves on to rotational solutions outside the star. There is no mention of von Zeipel's theorem, which demonstrates the difficulties of the subject, and no reference to Jean-Louis Tassoul's *Theory of Rotating Stars* (Princeton U. P., 1978) where the student can find a more complete and correct treatment of this subject. The segment's