important subjects are omitted. Each chapter ends with numerous problems that often introduce the reader to the sections omitted, for example, such topics as gradient wind, Richardson Number and Monin–Obukhov length. The problems also contain explanatory material that often helps in understanding the text.

The brevity of many chapters sometimes makes an understanding of the subjects difficult. For example, it is not made clear that the hydrostatic equation, given in chapter 1, is a special case of the equation of motion, given in chapter 7. And, as another example, the description of turbulence spectra is so brief that the reader cannot possibly appreciate their complexity.

Further, the chapter on the upper atmosphere makes no mention of electrically charged constituents, which give the thermosphere its most distinctive properties. Also, in this chapter, the catalytic destruction of ozone is only casually mentioned even though it is of great importance in contemporary problems.

In spite of the rather uneven weighting of different topics, with radiation being treated more thoroughly than other subjects, the book largely fulfills the purpose for which it was designed—it gives physical scientists and engineers a good overview of atmospheric physics. However, it is suggested that a reader interested in a deeper understanding of the fields of atmospheric motion and mass should consult one of the excellent recent books on dynamic meteorology, for example, those by James R. Holton (Academic, 1972), and by John A. Dutton (McGraw, 1976).

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What Is the World Made Of?

G. Feinberg
290 pp. Anchor-Doubleday, Garden City, N.Y., 1977. $10.00

In *What Is the World Made Of? Atoms, Leptons, Quarks, and Other Tantalizing Particles,* Gerald Feinberg has achieved an important goal. He has described all of microscopic physics from atomic spectroscopy to the most recent developments in charm. No earlier book has done so much but Feinberg goes even further. He has explained this vast sweep of physics without once relying on a formula. In spite of this constraint, Feinberg is able to move gracefully through this sophisticated subject with explanations that suffice for both the serious layman as well as the demanding physicist.

Feinberg, professor of physics at Columbia University, has made many contributions to theoretical physics. Some years ago he wrote *The Prometheus Project*, an interesting book that constitutes a unique credential for writing to a wider community about the importance and the meaning of present-day microphysics.

Feinberg uses essentially an historical approach to develop a number of concepts early in the book that he is later able to deploy to advantage in explaining one or another subject. *What Is the World Made Of?* starts with a short introduction to preatomic physics. Here Feinberg introduces the important conservation laws that play such a significant role in physics but are often neglected in general explanations. He next goes on to explore atoms and quantum mechanics. His explanations in both areas are facile and intriguing. He moves through relativity quickly and then presents a particularly clear review of nuclear physics, touching on many interesting aspects and also emphasizing that not all physics grows out of simple models. From nuclear physics he explains subnuclear physics, working almost to the present day. His discussion of the quark model is particularly interesting, incorporating some points of the model often ignored. His explanation of particle scattering serves to highlight an area that is important for experiments but not often touched in trying to explain the field. All in all, the book is comprehensive and covers most of the topics needed to explain microphysics to someone outside particle physics.

Who should read *What Is the World Made Of?* To start with, many physicists. Feinberg's book is a bench mark for explanations that really explain without resorting to in-group terminology. All too often physicists reaching out to a general audience too soon revert to their own jargon. Beyond physicists, it becomes harder to identify the readers. Feinberg's book, ambitious in its aims, is still heavy reading. Perhaps the most obvious candidates for readers are undergraduates seriously involved in science and scholars looking for a comprehensive overview of modern particle physics. Few casual fireside readers will work through the book to the end.

Midway in the book, Feinberg reminds us that "The relevance of all theoretical ideas to natural phenomena rests ultimately on the application of the inventions of these instrument makers. It is especially important to remember this because the greater ease of describing developments in theoretical physics can easily be distorted into the conclusion that such theoretical developments are the essential part of physics . . . ." In spite of this disclaimer it is clear that Feinberg favors the widely held view of the "hegemony of theory over experiments." Other viewpoints are possible. Nigel Calder, in his book *The Key to the Universe,* says that "theory and experimental discovery worked together like two hands on a double-ended saw."

Whether or not Feinberg's viewpoint serves the purpose of a physicist introducing his subject to a wider audience is still another question. Just after *What Is the World Made Of?* was completed Feinberg was present at a news briefing held at the Columbia Physics Department announcing the discovery of a charmed baryon. Feinberg along with other members of the department worked hard to explain the whys and ways of charm to a particularly obdurate science reporter who wanted to know how to explain the concept to the subway straphanger. After the briefing an august member of the department remarked that they should have talked about the experiment and forgot the theory.

When Feinberg does talk about experiments it is done well. He sees experiments with a clear eye, a clearer eye than most experimentalists. He is always in touch with the elements that would attract the attention of a non-physicist. His discussion of the CERN neutral-current experiment is just right.

In summary, *What Is the World Made Of?* is a wide-ranging text that gives complete coverage to microphysics. More experiments and illustrations might have sparked the book even more.

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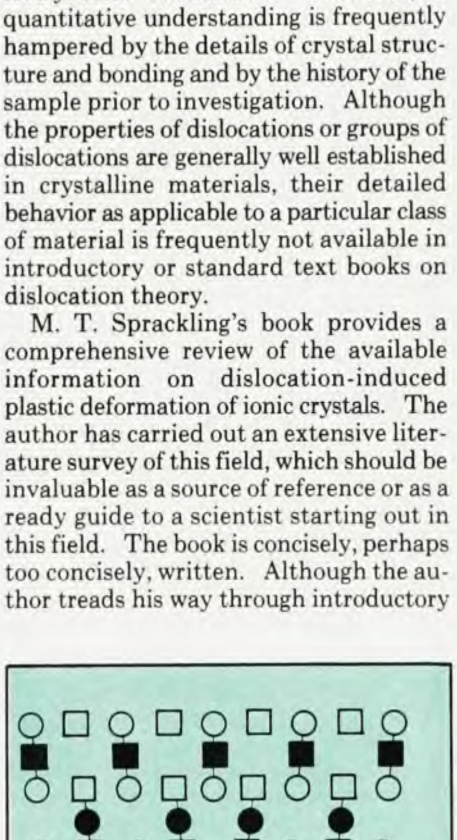
The Plastic Deformation of Simple Ionic Crystals

M. T. Sprackling
242 pp. Academic, London, 1977. £9.20

Our broad understanding of the mechanical properties of crystalline solids in terms of dislocation theory is on a relatively firm foundation. However, a quantitative understanding is frequently hampered by the details of crystal structure and bonding and by the history of the sample prior to investigation. Although the properties of dislocations or groups of dislocations are generally well established in crystalline materials, their detailed behavior as applicable to a particular class of material is frequently not available in introductory or standard text books on dislocation theory.

M. T. Sprackling's book provides a comprehensive review of the available information on dislocation-induced plastic deformation of ionic crystals. The author has carried out an extensive literature survey of this field, which should be invaluable as a source of reference or as a ready guide to a scientist starting out in this field. The book is concisely, perhaps too concisely, written. Although the author treads his way through introductory material on both the nature and properties of dislocations and ionic crystals, I found the treatment too brief and would guess that it might be difficult reading for someone uninitiated to dislocation theory or ionic solids. However, to someone somewhat familiar with these two fields, the book by Sprackling provides useful reading.



Fluorite structure with pure (001) $[1\bar{1}0]$ edge dislocation. Ions in the plane of the paper are represented by circles; those at $a/4$ $[110]$ by squares. The black circles and squares are cations (positively charged ions); the white ones are anions (negatively charged ions). From the book by M. T. Sprackling.

Following the introductory sections the author proceeds to examine dislocation interactions, nucleation and multiplication in ionic crystals. Dislocation mobility in ionic crystals is treated at some length. A variety of phenomena, such as the photoplastic effect charge flow, are touched upon. In the final chapters of the book the author develops the deformation behavior of single and polycrystalline materials under various loading conditions. He concludes with a chapter on strain hardening and describes the current state of our knowledge on the yield stress and work hardening of ionic crystals.

In summary this book provides a useful survey and extensive bibliography of plastic properties of ionic crystals. It is not a standard textbook but can serve as a source of reference. It should be a useful book for investigators in the field of ionic solids as well as for those interested in mechanical properties of solids.

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Dynamics of Polymeric Liquids, Vols. 1 and 2

R. B. Bird, R. C. Armstrong, O. Hassager, C. F. Curtiss
470 and 257 pp. Wiley, New York, 1977. $26.95

Those of us who work in the field of rheology, and particularly in polymer fluid dynamics, have long savored the rumor, and subsequently the imminence, of a text to be written by R. Byron Bird, professor of chemical engineering at the University of Wisconsin, and his colleagues. The waiting has ended; the book is outstanding in every respect.

Indeed we have two books. Volume 1 (Fluid Mechanics) is written by Bird and two of his young colleagues: Robert C. Armstrong (now at MIT) and Ole Hassager (now at the Instituttet for Kemiteknik, Denmark). In volume 2 (Kinetic Theory) these authors are joined by Charles F. Curtiss, Associate Director of the Theoretical Chemistry Institute of the University of Wisconsin.

Without detracting from the contributions of any of the authors, it is good to acknowledge the clarity of purpose and organization that one associates with Bird as a teacher and scholar and that is re-