covered not by a physicist but by a naval surgeon, Julius Robert Mayer, who was examining the blood of European sailors? Or that it was neither Herman Helmholtz nor Lord Kelvin who first thought of gravitational contraction as a mechanism to explain the Sun's heat but was instead an obscure Scottish physicist named John Waterston, who had several papers rejected for publication? *A Concise History of Solar and Stellar Physics* does much to rescue such discoverers from oblivion and restore them to their rightful place in the canon of the history of astronomy.

Taking on the history of solar and stellar astronomy from 1900 onward is a mammoth task, and it is perhaps inevitable that the book has notable gaps and an obvious lack of emphasis on astronomical observations. For example, a single page is devoted to solar flares, with the barest mention (in a footnote) given to theories of how magnetic energy is converted to heat and particle acceleration. No mention is made of stellar flares, despite the topic's venerable history, which dates to Bernard Lovell's observations at Jodrell Bank Observatory in England. Readers will search in vain for many of the discoveries made by spacecraft. I found the omitted elucidation of the connection between fast solar wind streams and coronal holes derived from *Skylab* observations particularly distressing.

A historian's view of a "golden age" is necessarily subjective. For the Tassouls, that age was 1940 through 1970. Was it so golden? To be sure, a great many discoveries, ranging from stellar population types—from Walter Baade's work on globular clusters as he observed Los Angeles's wartime-darkened skies—to pulsars were made during that period. But such discoveries continued well into the 1970s and beyond, with, for example, the dramatically improved understanding of solar and stellar coronae obtained from measurements with spacecraft instruments. Yet the Tassouls label the period from 1970 onward as the "Age of Specialization," when no epoch-making monographs were written but only masses of multiauthored papers. Their take on that age is either pessimistic or realistic, depending on one's point of view.

An attractive feature is the collection of portraits of many leading—and some lesser-known—astronomers, with short biographies that will delight many readers. The line drawings adequately illustrate points made in the text and are clear rather than elaborate. Like any good historical account, the book contains lavish, informative footnotes with up-to-date references. However, I question the need for many of the book's several appendixes.

A Concise History of Solar and Stellar Physics is clearly not aimed at a general audience. Nonspecialists will be put off by some of the very detailed accounts, such as models of solar and stellar interiors. Yet the broad sweep of subjects that are covered will make the book useful to physics and astronomy undergraduates and others who wish to delve into the subject's past and improve their scientific literacy.

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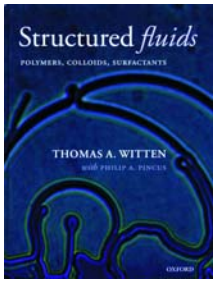
Structured Fluids: Polymers, Colloids, Surfactants

Thomas A. Witten (with Philip A. Pincus)
Oxford U. Press, New York, 2004. $74.50 (216 pp.). ISBN 0-19-852688-1

The study of soft condensed matter or complex fluids is only beginning to be an accepted sub-branch of condensed

matter physics. The physics departments of some major academic institutions still do not cover it, perhaps in part because of a lack of suitable textbooks. *Structured Fluids: Polymers, Colloids, Surfactants* by Thomas Witten, one of the preeminent theorists in the field, represents an important and valuable contribution that should help fill the gap.

Soft condensed matter physics is the physics of materials around us, materials that we can touch, see, and feel. The study of the field should reflect this definition, and teaching it should include both intuitive and physical explanations for the materials and their properties. Yet such a task is very difficult because it requires profound knowledge about the subject. In this respect, Witten's book excels. The author explains topics elegantly and in detail and provides a unique depth of understanding and intuition about physics. The book is full of delightful "Wittencisms"—explanations that provide tremendous insight while teaching readers how to make a valid order-of-magnitude estimate. For example, the author offers a thorough explanation of why all simple fluids have roughly the same viscosity, and he shows how to estimate the value of their viscosity from basic, physical arguments.



Soft condensed matter physics is a very broad field, and Witten does not pretend to cover all aspects of it. Instead, he focuses on topics mentioned in the title: polymers, colloids, and surfactants. He covers the subjects well and provides an excellent overview of each. Of course, the individual topics are covered more completely by other textbooks, such as *Statistical Thermodynamics of Surfaces, Interfaces, and Membranes* (Addison-Wesley, 1994) by Samuel Safran, which covers surfactants, and *Polymer Physics* (Oxford U. Press, 2003) by Michael Rubinstein and Ralph Colby.

Some topics are conspicuously missing from Witten's book, among them foams and emulsions. Liquid crystals are discussed only briefly, in the chapter on colloids, as representing anisotropic particles. But in no way do such omissions detract from what is covered overall. For readers seeking broader coverage but at a less mathematical level, Richard Jones's *Soft Condensed Matter* (Oxford U. Press, 2002) is available, which I also reviewed for the June 2003 issue of PHYSICS TODAY (page 63). Although Witten's text lacks the depth and rigor of Paul Chaikin and Tom Lubensky's classic *Principles of Condensed Matter Physics* (Cambridge U. Press, 1995), it straddles all those mentioned and provides a wonderful combination of insight and breadth of coverage.

Structured Fluids is clearly written by a theorist; nevertheless, many experimental techniques are discussed, albeit briefly. The author provides a detailed discussion of scattering, although it is in the chapter on polymers rather than the one on experimental methods. Also, for completeness, Witten includes in chapter 2 a brief introduction to statistical physics. Although that introduction will never replace a full course on the topic, it does offer enough background to make the book a self-contained textbook.

Structured Fluids is well constructed and a pleasure to read. Its text covers about two-thirds of each page, with space alongside reserved for figures and notes. Several of the chapters have lengthy appendixes in which the author discusses certain topics in more depth. Witten provides one such appendix on colloid aggregation, an area in which he has made many important contributions.

At the advanced undergraduate or beginning graduate level, Witten's book will make an excellent textbook for a physics course on condensed matter, soft condensed matter, or complex fluids. It contains many exercises, embedded directly in the text, that are particularly apt for a course on soft condensed matter physics. They emphasize intuition and order-of-magnitude estimates over rigor and precise numerical calculations—exactly the sort of philosophy that is essential in order to appreciate modern soft condensed matter physics. Moreover, the problems sometimes entail numerical simulation and even some simple but illuminating experiments. Such features are exactly what a textbook on soft condensed matter physics should have.

I suspect *Structured Fluids* will be widely used and will be a must for any student of soft condensed matter physics. Even practicing condensed matter physicists will gain a great deal of insight from it, and I predict it will become a fixture on many bookshelves. It certainly is one on mine.

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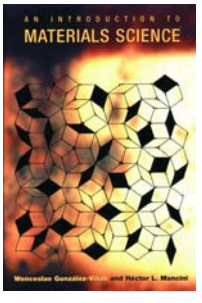
An Introduction to Materials Science

Wenceslao González-Viñas and Héctor L. Mancini
Princeton U. Press, Princeton, NJ, 2004. $60.00 (180 pp.). ISBN 0-691-07097-0

An Introduction to Materials Science by Wenceslao González-Viñas and Héctor Mancini is a concise and informative entry-level text for students in any area of materials science. It has an ambitious scope and thorough table of contents, with 12 chapters on such topics as crystalline solids; imperfections; electrical, mechanical, and thermal properties; magnetic materials; superconductivity; optical, noncrystalline, and polymeric materials; and surface science. The authors cover these topics in a range of detail, from the comprehensive presentation on processes within optical materials in chapter 8 to the more succinct descriptions of crystalline solids and surface science in chapters 2 and 11, respectively.

The strengths of the text include chapter 10 on polymeric materials. The authors present an excellent introduction, followed by classification schemes and a relatively in-depth treatment of molecular structure. Physical properties of polymeric materials receive an extensive review, and references to earlier portions of the text are useful and appropriate. Also notable is chapter 9 on noncrystalline materials, which, combined with chapter 8, makes for a very thorough presentation on noncrystalline solids in general. The authors note in the preface that they strive to focus on more current, developing topics (new materials, biomaterials, devices, and so forth) and have thus chosen to omit more classical topics such as metallurgy and ceramics. Their decision is appropriate, in my opinion, and omitting those topics from the text is by no means detrimental to its vision.



The book, however, is not without its shortcomings; some of them are rather troubling. In general, I get the impression that the authors have not properly decided on an audience. The preface mentions that "this book tries to reach undergraduate students," yet much of the text and its corresponding mathematics are often presented at such disparate levels of difficulty that