

dedicated to it and, as a consequence, the discussion of it felt overly concise. For example, Johnson does not mention the giant telescopes expected to come on line in the next 10 years. A discussion of those telescopes, whose primary mirrors have diameters of 20–40 m, would not only be an inspiring glimpse into future endeavors, it would also be a relevant addition to the description of the resolution and sensitivity required to directly image exoplanets.

From its cover, you may not immediately realize what *How Do You Find an Exoplanet?* is about. You'll find no depictions of imagined far-off star systems and alien-looking worlds, as is common for books on exoplanets. The paper is not glossy and the text and diagrams are black and white. The minimalist styling works in the book's favor; no distractions or superfluous images divert readers' attention from the important key concepts. I will certainly recommend the book to students interested in understanding exoplanet discovery.

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Introduction to the Theory of Soft Matter From Ideal Gases to Liquid Crystals

Jonathan V. Selinger

Springer, 2016. \$99.00 (185 pp.).
ISBN 978-3-319-21053-7

Increasingly interdisciplinary approaches in science and engineering require physicists to train students with non-physics backgrounds to apply the methods and principles of physics to new research areas. That is a particularly challenging task with soft matter, a field that brings diverse disciplinary perspectives to bear on a broad class of materials and phenomena. Jonathan Selinger's new book, *Introduction to the Theory of Soft Matter: From Ideal Gases to Liquid Crystals*, presents students with many of the key methods and principles of condensed-matter theory that have been valuable for understanding and engineering soft matter, with a particu-

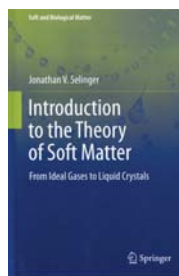
lar focus on the theory of liquid crystals.

Selinger, from the Liquid Crystal Institute at Kent State University, is an expert on the statistical physics of liquid-crystalline matter. His research ranges from the flexoelectric effect (a strain gradient inducing an electric polarization) to rubbery liquid-crystalline elastomers. This book has its roots in the lectures on soft matter he gives to first-year graduate

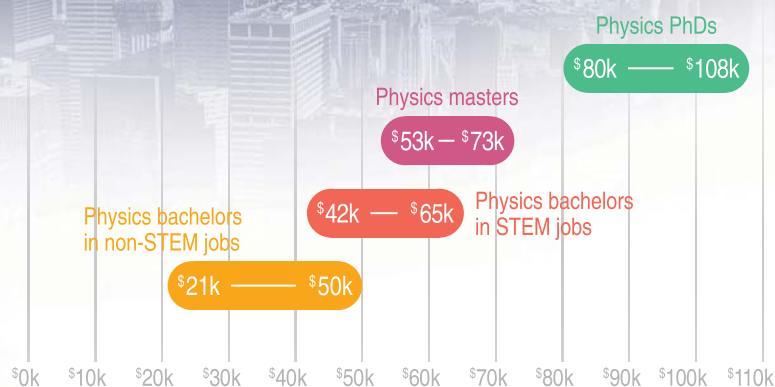
students in chemical physics. Students enter that class from such diverse undergraduate backgrounds as physics, organic chemistry, materials science, and chemical engineering. According to Selinger, the aim of the book is twofold. First, it is an entry-level course for physics students going on to more advanced theoretical research. Second, it provides students without a physics background, and who will likely pursue experimental research in their graduate work, with a basic literacy in the terminology, concepts, and mathematical formalisms needed to engage with physical theories of liquid crystals and other soft matter.

The book is organized into 10 chapters and can be roughly grouped into two parts. The first covers introductory concepts and methods of statistical mechanics of condensed matter, including probability, entropy, order and symmetry, mean-field theory and phase transitions, and elementary field theory. The second part applies those concepts to selected topics in soft-matter physics, including phase transition dynamics and solids and glasses. The final chapter covers elements of liquid-crystal physics, from mesophase order and generalized elasticity to topological defects. Two "mathematical interludes" present essential elements of variational calculus and tensor manipulations for students who have not encountered those techniques in their undergraduate training.

Each chapter is built around one or two physical models—for example, the Ising model and van der Waals theory are used in the early chapters—with carefully presented derivations and discussions intended to demonstrate important principles. In most cases, key results are derived from multiple perspectives in order to emphasize both intuition and technical rigor. In comparison with other introductory texts on soft



Starting salaries in the private sector



Typical starting salaries (in thousands of dollars) for physics degree recipients, classes of 2013 & 2014

Typical salaries are the middle 50%, i.e., between the 25th and 75th percentiles.
STEM refers to positions in science, technology, engineering, and math.

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matter, Selinger's book focuses more on key concepts and core principles and less on presenting the diverse array of problems in soft-matter systems. In that way, Selinger's approach is similar to that of *Principles of Condensed Matter Physics* by Paul Chaikin and Tom Lubensky (Cambridge University Press, 2000), but it is accessible at a more elementary level. The writing is very conversational, and Selinger's lecture style really comes through as he repeatedly raises common questions and acknowledges points of confusion for discussion.

A unique aspect of the book is the use of interactive online figures to illustrate many of the book's concepts. The figures are available online in Wolfram's CDF format and viewable in Mathematica or a freely available CDF player. Readers are able to manipulate model parameters, such as temperature or an external field, via sliders. In that way, engaged readers can internalize important lessons of the statistical theories presented in the book, even before they master the more technical aspects of tensor-based and field-theoretical derivations. A limitation of that otherwise nice feature is the clumsy access provided by Springer, which requires typing a cumbersome 133-character URL into a browser.

Some instructors might feel that the heavy focus on liquid crystals provides too narrow a slice of soft matter. Several broadly relevant topics, including polymers, supramolecular assembly, and diffusion, make no appearance in the book. One suspects, however, that the relatively narrow scope is intentional, so as to maintain a more coherent conceptual and mathematical framework throughout. The book might also benefit from additional problems that would help students to strengthen their engagement with the material.

Minor limitations aside, *Introduction to the Theory of Soft Matter* is a well-written and engaging text that serves an unmet need. It will be a valuable asset for students and junior researchers who are in a growing interdisciplinary field and are looking for an approachable yet rigorous introduction to many of its cornerstone principles.

Greg Grason

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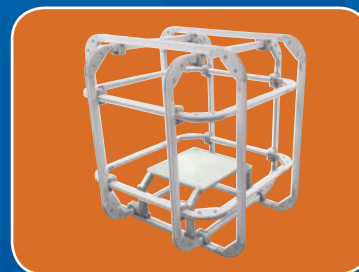
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