ly to descriptions of flexible species that may undergo conformational transitions and chemical rearrangements. It also seems to be the most fruitful way to think about assemblies in solution, including biopolymers, micelles, and bilayers. These interesting issues are, however, not addressed in the book. Its primary contribution is to present a detailed description of what is known about intermolecular potentials and a discussion of how to express this knowledge in terms of semi-invariants and how to perform reasonably accurate statistical-mechanical calculations, when appropriate, with semi-invariant methods. It is an exhaustive and welcome treatise that will serve as the standard source on this type of approach. Unfortunately, almost nothing is said in the book about methods of computer simulation, and only a cursory description of the atomistic formulations of molecular fluids is presented. In my opinion, it is these methods that will ultimately prove most useful in attacking problems at the new frontiers of liquid state science.

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Theoretical Physics

Theoretical Concepts in Physics. An Alternative View of Theoretical Reasoning in Physics for Final-Year Undergraduates. M. S. LONGAIR. Cambridge University Press, New York, 1984. xiv, 366 pp., illus. $49.50; paper, $14.95.

It is rare to find a course beyond the introductory level that places an entire field in perspective, so that the instructor may dwell on the subtleties and the power of the important concepts without having to worry about getting bogged down in providing the necessary technical background. M. S. Longair has had an opportunity to put together such a course, and the book under review is the happy by-product. Longair approaches the development of the theoretical concepts of physics by means of seven case studies. These are "The origins of Newton's law of gravitation," "Maxwell's equations," "Mechanics and dynamics," "Thermodynamics and statistical mechanics," "The origins of the concept of quanta," "Special relativity," and "General relativity and cosmology."

The methods of the original papers, albeit in modern notation, are used in the development of each subject. Longair departs from this procedure, however, in discussing relativity and cosmology, the subjects closest to his own specialty, astrophysics. Here he gives a concise, yet intellectually complete, introduction to each subject, using simple physical, rather than formal mathematical, arguments. At the end of most of the case studies there is an appendix in which either technical background material is provided or interesting applications of the concepts are set forth. Although occasionally containing some clever derivations, the appendixes are somewhat jarring in their interruption of the flow and style of the main narrative.

The author speaks directly to the reader in an informal manner as he traces the difficulties faced by Newton, Maxwell, Planck, Einstein, and others in their work. He occasionally uses the resolution of these difficulties as a basis for offering advice on how to approach problems in physics. He conveys a continuing sense of intellectual excitement and highlights what he considers to be remarkable and miraculous achievements.

Some amusing and little-known topics, such as Kepler's analysis of the orbits of the five innermost planets in terms of properties of the five regular solids and Maxwell's representation of a magnetic field in terms of rotating vortices, are discussed in the early chapters, but these are hard for a modern physicist or physics student to relate to. Of more current interest is the section on thermodynamics and statistical mechanics.

The centerpiece of the presentation, a story that the author obviously takes great delight in retelling, is the development of the early quantum theory by Planck and Einstein as arising from the failure of purely classical concepts to account for the properties of black-body radiation. The discussion here is very complete.

Although almost all of the material in the book can be found elsewhere, it is good to have such a diverse yet unified set of topics discussed in one place. The book will be useful not only in the type of course for which it was designed but also to bright younger students who would like to read up on the exciting parts of physics. It is unfortunate, but understandable, that, with the exception of the discussion of cosmology, Longair did not include problems that have been occupying physicists over the past 60 years. Perhaps he will write a sequel (or, more necessarily, several).

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