Olesko's penultimate chapter on the little-known "workaday world" of the secondary-school physics teacher, which was the career choice for nearly half of Neumann's students, many of whom successfully managed to carry on some research despite lack of time and facilities. In contrast, Olesko says almost nothing about the tiny fraction of Neumann's students who found careers in industry, which at that time had scarcely any jobs for physicists. Ironically, one of the formative influences on Neumann's own teaching was the astronomer Friedrich Wilhelm Bessel, who had come to science from a successful business career; he believed that strong science teaching was "the true foundation for arts and trade" (p. 30). Although Olesko does not explore this issue, one might ask how much the successes of late-19th-century German science-based industrialization were owed to graduates of those secondary schools in which Neumann's students and others like them taught the scientific spirit and discipline of precision for which German engineering became famous.

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Superfluid Vortices

Quantized Vortices in Helium II. RUSSELL L. DONNELLY. Cambridge University Press, New York, 1991. xviii, 346 pp., illus. $95. Cambridge Studies in Low Temperature Physics, 3.

Helium II, the liquid state of the isotope ^4He that occurs at temperatures below 2.17 K, contains a superfluid component that is the closest realization in nature of an ideal Eulerian (nonviscous) fluid. Moreover, He II supports vortices—localized string-like states of circulating superfluid having arbitrary length but only a single unique strength or circulation (that is, they are quantized, as befits an object existing within a macroscopic quantum state). Following Delphic remarks by Lars Onsager in 1949 and a more specific prediction of quantized vortices by Richard Feynman six years later ensued intense research involving some of the most difficult and imaginative experiments ever performed by "small" science. These were sometimes inspired and their results sometimes explained by equally imaginative and frequently adequate phenomenological theories. This book is a record of the 40 years after Onsager by one of the foremost practitioners of both experiment and theory, who was either on the spot or quickly arrived at most of the major events.

This is not a textbook, though there is a helpful review of classical and quantum fluid dynamics in the first two chapters that serves to introduce concepts. A course in introductory quantum mechanics together with one in hydrodynamics should enable a reader to follow most of the arguments (except in the later chapters, where the arcane nature of theories that use classical hydrodynamic reasoning at the level of an interatomic spacing requires statements like "The [omitted] details are somewhat tedious").

Nor is this a book on experimental or theoretical techniques—it is a catalog of results. More than that, it is a guide to and history of achievements. Donnelly does not overstate progress or gloss over difficulties: "A first principles quantum mechanical description of the vortex core in helium II has yet to be devised," or "the way breakdown [of ideal superflow] occurs is . . . obscure."

The book covers individual topics according to the historical progression of published work. Heavy emphasis is given to papers by Donnelly's students and collaborators, although the work of others is cited and sometimes described at length. There are no claims for completeness in literature citation or for authority in establishing priority. Puzzles and discrepancies that may exist are discreetly mentioned but not dwelt upon. Results are mostly presented in the language and notation of the original papers rather than being reworked to conform to some more general pedagogical or scientific schema. The tutorial introduction that often precedes a topic does not go beyond the results of the papers to be discussed.

The major topics are examined in six chapters: vortex dynamics and mutual friction, vortex structure, vortex arrays, vortex waves, superfluid turbulence, and thermal activation and vortex nucleation. These progressively longer chapters treat an impressive collection of subtopics. Absent topics include the controversial ac Josephson effect, vortex interaction with the free surface, radial counterflow in a rotating annulus, and tests of homogeneous nucleation theory using film flow. None of the formal mathematical progress on quantized vortices (involving diffeomorphisms, homotopy groups, Casimirs, and so on) is mentioned, since that work neither addresses data nor admits experimental testing. However, an attempt in applied mathematics to describe He II turbulence quantitatively is also omitted. An exception to the otherwise disciplined neglect of irrelevant subject matter is the four pages devoted to neutron stars.

The chronology of cited references shows that research activity on He II vortices is diminishing. This book thus serves as the summary of a natural period of research. Unlike supercurrent vortices in type II superconductors, or even vortices in superfluid ^3He, the He II variety have not become the basis of significant further development despite the equal precision of their quantization and their sensitivity to superflow. This underemployment stems from the lack of an intrinsic electromagnetic field, which makes He II vortex behavior difficult to measure and control. But nature's best "mechanical vacuum" and her simplest macroscopic quantum state with its quasi-classical vortex lines will continue to fascinate and especially to challenge those who would explain more complicated and less accessible systems. Expect no better book on the subject this century.

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Some Other Books of Interest

Taphonomy. Releasing the Data Locked in the Fossil Record. PETER A. ALLISON and DEREK E. G. BRIGGS, Eds. Plenum, New York, 1991. xiv, 560 pp., illus., + table. $95. Topics in Geobiology, vol. 9.

Since the appearance in 1972 of an English translation of Wilhelm Schäfer's classic treatise *Aktuo-paläontologie nach Studien in der Nordsee* (see *Science* **179**, 675 [1973]; also **246**, 1505 [1989]) studies of the processes that determine how organisms are preserved as fossils have coalesced under the rubric of taphonomy. This enterprise has now, as the editors of the present volume note in their preface, advanced beyond the stage of descriptive paleontology to become an interdisciplinary analytic enterprise. Its various current concerns are represented in this collection of reviews. After an opening outline by Logan *et al.* of "molecular taphonomy"—the preservation of nucleic acids, proteins, carbohydrates, lipids, and other biomolecules—the editors themselves survey the preservation of nonmineralized (soft) tissues and wholly soft-bodied organisms, discussing a number of *Konservat-Langstätten* (deposits characterized by exceptional preservation such as the Burgess Shale). A consideration by Spicer of taphonomic processes affecting plants, which present special difficulties because they are seldom preserved whole, is followed by two extensive treatments of shelly faunas—Kidwell and Bosence on temporal and spatial fluctuations ("time-averaging") and Kidwell on stratigraphic issues. Behrensmeyer then