# A TAPESTRY OF CONTRIBUTIONS TO SUPERFLUID HELIUM

## Quantized Vortices in Helium II

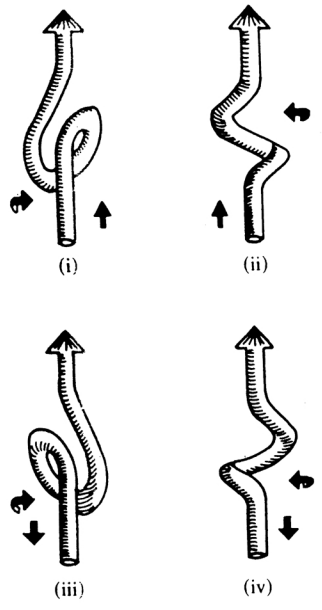
**Russell J. Donnelly**
*Cambridge U.P., New York, 1991. 346 pp. $95.00 hc*
*ISBN 0-521-32400-9*

*Reviewed by Robert Hallock*

Russell Donnelly has had a long and distinguished career in the study of liquid helium and has made important contributions to the experimental and theoretical development of our understanding of vortices in superfluid helium. Cambridge University Press would have had a hard time finding someone more experienced to write about quantized vortices. For Donnelly, the task appears to have been a labor of love and an opportunity to bring together the work of his group and that contained in the roughly 500 manuscripts cited in this book.

For those interested in the subject, the book will be a required companion because it comments on and places in context much of the important work in the field. The background material for some topics is written in the style of a review paper, with works cited and their relevance and important conclusions described. The treatment of other topics (for example, vortex waves or the thermal activation and nucleation of vortices) is more thorough, much in the style of a good textbook, with careful exposition and attention to detail.

The first quarter of the book is devoted to a very helpful presentation of background material on classical hydrodynamics and superfluid helium; later chapters draw freely on this background information. The remaining six chapters deal with the structure and dynamics of quantized vortices, vortex arrays, mutual friction, waves in and on vortices, superfluid turbulence and vortex activation and nucleation. In these later chapters the reader gains a fine perspective on both the historical development and current status of the field. The author references several excellent reviews and draws from them where appropriate.




**Possible shapes of solitary waves** (kink wave solitons) on their vortex cores: left kink (*i*), left antikink (*ii*), right kink (*iii*) and right antikink (*iv*). (From *Quantized Vortices in Helium II*.)

Donnelly's familiarity with the history of the subject shows up in a number of areas. For example, there are occasional tidbits where Donnelly flashes back unexpectedly to an historical early reference to make note of an original idea, the original source of which has been forgotten or overlooked by many in the community. The book's strengths include its discussion of the early work of Joseph Vinen on the observation of the quantization of circulation, its depth of treatment of vortex waves and its excellent treatment of thermal activation and nucleation.

Naturally the book covers many of the important contributions to this field made by Donnelly and his collaborators. The book also does a fine job of presenting the work of William Glaberson. Important work by Klaus Schwarz is also discussed, but in less depth. The substantial contributions made by James Tough's group to the area of counterflow are relatively lightly covered; fortunately Tough's excellent review article is referenced several times. The major contributions of many others, both theoretical and experimental, are woven into a comprehensive tapestry that holds together very well.

*Quantized Vortices in Helium II* is a fine book and a strong contribution to Cambridge University Press's new series in low-temperature physics. It is an important addition to the literature of liquid helium and certainly required and valuable reading for anyone interested in vorticity in superfluid helium.

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## Quantum Mechanics on the Macintosh

**Sigmund Brandt and Hans Dieter Dahmen**
*Springer-Verlag, New York, 1991. 306 pp. $44.95 hc*
*ISBN 0-387-97627-2*

Both experience and research show that classical mechanics presents substantial conceptual obstacles for students and that laboratory exercises can play an important role in surmounting those obstacles. It is therefore unfortunate that courses in quantum mechanics, with concepts even more abstract, are normally offered without laboratory sessions. *Quantum Mechanics on the Macintosh* fills this gap by letting students plot