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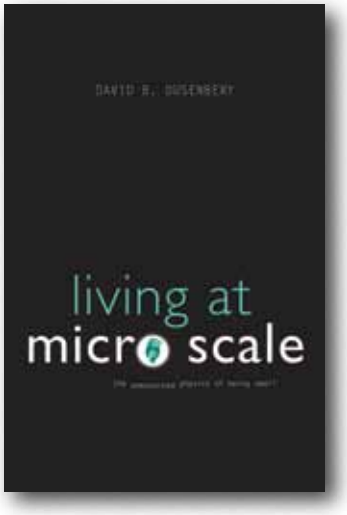
with follow-up questions, further readings, and insightful notes (references). The book ends with a glossary and an index. Other competing books have started to appear (see the 2008 *Oceanography* review [21:208–209] of W.J. Burroughs' *Climate Change*, 2nd edition). However, Houghton's *Global Warming: The Complete Briefing* sets the standard for these other competing texts.

James P.M. Syvitski *(james.syvitski@colorado.edu) is Professor and Executive Director, Community Surface Dynamics Modeling System, University of Colorado at Boulder, Boulder, CO, USA.*

Living at Micro Scale: The Unexpected Physics of Being Small

By David B. Dusenbery, Harvard University Press, 2009, 416 pages, ISBN: 978-0-674-03116-6, Hardcover, $49.95 US

REVIEWED BY GEORGE JACKSON



Planktonic organisms live in a world where viscosity, molecular diffusion, and thermal fluctuations dominate, a world outside the mainstream of ocean physics studies. The task of explaining the properties of this domain has fallen to talented biologists, such as Vogel (1981), Berg (1983), and Denny (1993), who provide intuitive understandings about it. Within the last year, two new books exploring the world of the small have arrived. The first, by Kiørboe (2008), has a strong emphasis on biological interactions, experimental tests, and oceanographic implications. The second, by David Dusenbery, published this year, emphasizes the physical nature of this realm.

Dusenbery is a sensory biologist, and his book *Sensory Ecology* (1992) was a classic synthesis of how sensory systems extract useful information from physical and chemical fluctuations to map out organisms' environments. It was noteworthy that he used insights from multiple disciplines to understand different organisms' worlds. The present book is similar in exhibiting his desire to synthesize, but here he tackles the world of the small.

The world of *Living at Micro Scale* is centered at 1 µm. It is a world where molecular diffusion is more important than advection in movement of material to and from cells, where shape is more important for providing stability than for reducing drag, and where size is a critical property in determining lifestyle. It is this realm that Dusenbery delineates with his use of simple formulae and scaling arguments from diffusion, viscous fluid flow, and information theories.

The author uses the first third of his book to provide background information, including formulae to be used later. The historical aspect here is particularly fascinating, as it reminds the reader of the importance of small-scale phenomena in the development of physics. In the second third of the book, Dusenbery explores the implications of this background material. The calculations shed light on movement of molecules to the microbe, both for nutrition and for information gathering; they show how size and shape constrain the ability of the microbe to move, either at random or in a directed way. In the last third of the book, the author discusses implications for how organisms interact, using size-based food webs and the fertilization of eggs by sperm as examples.

To appreciate *Living at Micro Scale*, it helps to have read Berg's short book *Random Walks in Biology* (1983), which explores bacterial motion and how it is affected by the small-scale chemical environment. Dusenbery's book is not so much a discussion about life in low Reynolds number environments as it is a fluid mechanic's interpretation of Berg's book. There is mention in *Living at Micro Scale* of more complex organisms and structures, but the emphasis is on microbes, what they can sense, how they move, and the costs and benefits of such movement. Dusenbery uses his extensive experience with sensory structures to consider how the small numbers of molecules available for an organism to sense affect its ability to choose. He also has the most extensive consideration of shape and its implications for diffusion,

fluid flow—particularly its effect on drag—and swimming that I know about. By considering all these physical elements of the aquatic environment, Dusenbery provides a masterful description of a microbe's world.

Because it does not systematically develop the theories, this book can be a difficult read for the nonspecialist. It has its eccentricities, such as dismissing the relevance of 100x differences in metabolic rates for a given diameter while pursuing 0.3x changes in drag associated with shape. In addition, this book does not incorporate relevant literature nor does it try to place microorganisms in the oceanic environment. For example, it does not discuss work done on the hydrodynamics of prey detection and predator-prey interactions or on transport considerations for viral infection in plankton. Kiørboe's *A Mechanistic Approach to Plankton Ecology* (2008) is a better starting point for that literature. However, for someone who is comfortable with the physical approach to the aquatic environment, the extensive consideration of microbial shape and size is fascinating and enlightening.

Living at Micro Scale is a very personal look at the water-microbe interface by a master of sensory biology.

George Jackson *(gjackson@tamu.edu) is Professor, Department of Oceanography, Texas A&M University, College Station, TX, USA.*

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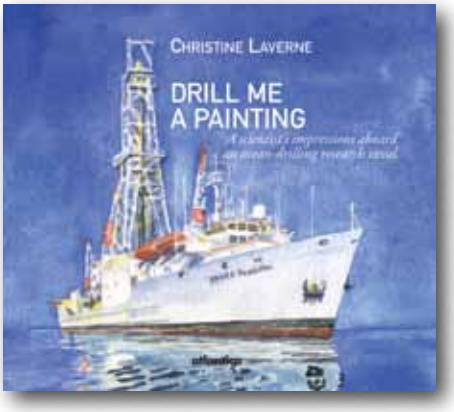

Drill Me a Painting: A Scientist's Impressions Aboard an Ocean Drilling Research Vessel

By Christine Laverne, Atlantica, 2008, 115 pages, ISBN 978-2-7588-0169-6, Softcover, 25 €

REVIEWED BY KATE MORAN

Christine Laverne's beautifully illustrated book titled *Drill Me a Painting* describes her almost 30-year-long adventure seeking to uncover mysteries of Earth's lithosphere buried deep beneath the ocean's seafloor. Laverne is a senior lecturer in geosciences at Paul Cézanne University Aix-Marseille III, France, as well as a watercolor illustrator. Her story is one that combines the personal with the science and high technology required for this type of adventure.

Laverne candidly describes both the joys and the personal stresses, traumas, and relationships aboard two of the world's most capable scientific drillships, first onboard *Glomar Challenger* and later, *JOIDES Resolution*. Intertwined with this adventurous drilling travelogue are clearly written and illustrated depictions of tectonic evolution, rocks that form the lithosphere, history of scientific drilling, and drilling tools. And an adventure would not be complete without the drama of the challenge itself, which Laverne includes by telling stories of broken drill pipe, equipment lost miles below the ship, the deep dark depths below the seafloor that had to be reached, and the trials of re-entering a borehole years after it was abandoned. This book is a short and pleasant read for those who have sailed or will sail—or dream of sailing—on ocean exploration expeditions. An added bonus is that the earth science and technology inserts can easily be adapted for use in the classroom.

Special Note: Integrated Ocean Drilling Program Management International has generously offered to provide a free copy of this lovely book to the first 50 people who send an e-mail request to book@iodp.org. Please include your name and full mailing address. IODP will send an acknowledgment, confirming the address, and telling you when to expect the book.

Kate Moran *(kate.moran@gso.uri.edu) is Professor of Oceanography and Associate Dean, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI, USA. She has sailed on seven scientific drilling expeditions and was Director, Ocean Drilling Program at Joint Oceanographic Institutions.*