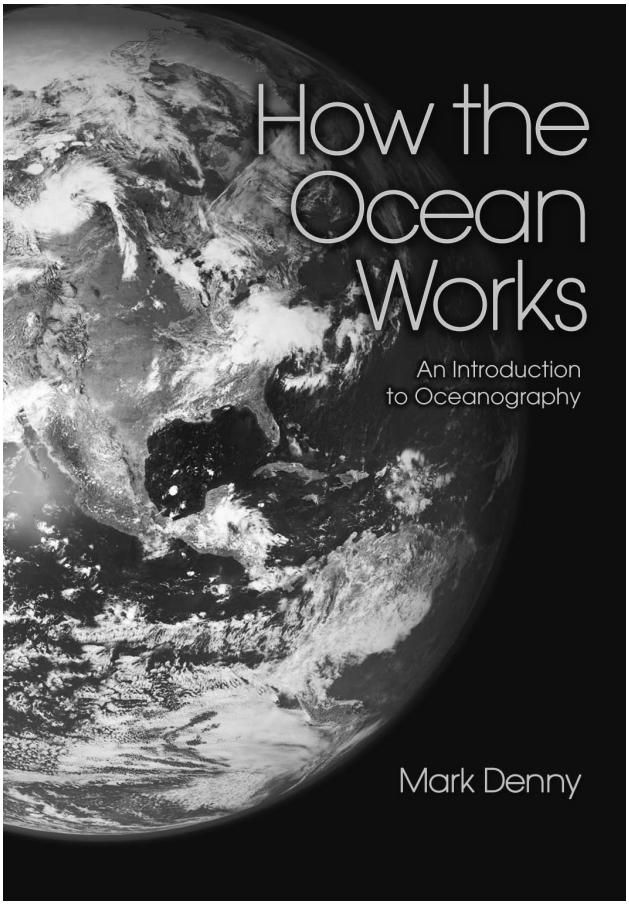
BOOK REVIEWS

ELIZABETH COWLES, DEPARTMENT EDITOR



OCEANOGRAPHY

How the Ocean Works: An Introduction to Oceanography. By Mark Denny. 2008. Princeton University Press. (ISBN: 978-0691126463). 344 pp. Hardcover. $99.50.

Mark Denny's introduction to the science of oceanography, ***How the Ocean Works: An Introduction to Oceanography,*** is a nontraditional text that uses an "ocean system" approach to educate his readers about the complex interrelationships among life, chemical nutrients, and the physical aspects of the world's oceans. His approach is unique among introductory texts, in that he focuses on the ocean as a system rather than breaking the science up into discrete, loosely-connected topics as most current introductory texts do.

The book is organized into 12 chapters, each containing information about particular aspects of the oceans and yet seamlessly flowing from one chapter to the next. The book begins with a comprehensive coverage of the history of ocean inquiry and discovery. This chapter portrays the discovery of the oceans as an integral and essential part of the human saga, ranging back from the spread of humans into the Americas, through the voyages of ocean discovery in the 18th and 19th centuries, and into the modern age in which satellites remotely collect oceanographic data. The second chapter covers the physiographic features of ocean basins and the seafloor, tied to their plate tectonic origins. The third chapter is a comprehensive introduction to seawater chemistry and characteristics.

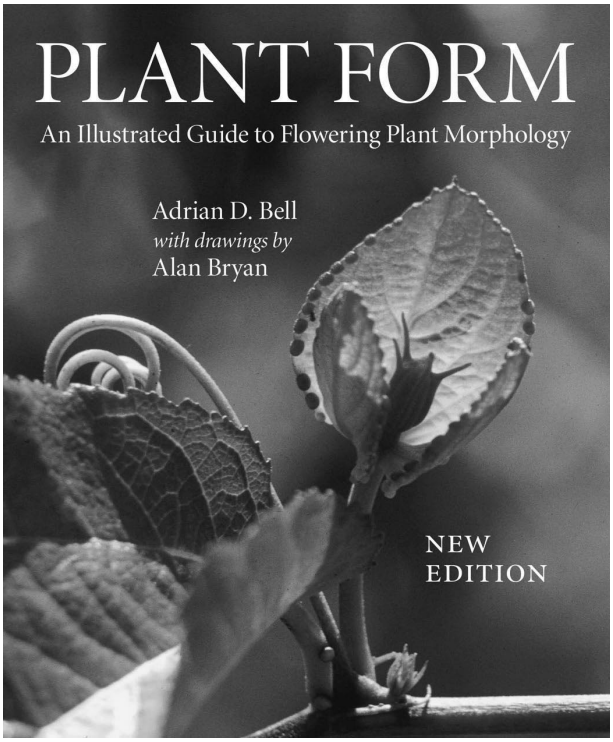
After the initial three chapters, ***How the Ocean Works*** diverges from most traditional oceanography texts with a detailed treatment of primary productivity, nutrient cycling, trophic structure, and the flow of energy through the ocean's pelagic ecosystem in Chapters 4 and 5. The next four chapters (6 through 9) provide a comprehensive introduction to the flow of seawater in the shallow and deep layers of the ocean. This treatment includes a great deal of information about the structure of water masses in the ocean, its heat budget, the Coriolis effect, and thermohaline circulation; more than most introductory texts, but in a way that illustrates the strong interactions among major Earth forces and their consequences on the ocean system and marine ecosystems. Chapter 10 further explores the complexities of the ocean system by examining the oceanic and atmospheric carbon cycle (including a section on global warming), the limiting effects of iron on oceanic productivity, and the complexities of aqueous carbonate chemistry. Chapter 11 illustrates the anthropogenic impacts on the marine ecosystem by examining the fishing industry. Finally, the book ends with a chapter that extends an invitation to readers to join the ranks of those who study the world's oceans.

How the Ocean Works is well-written and edited, and flows more like a narrative than a science textbook. It focuses on understanding concepts rather than simply listing facts. I would anticipate that it will be easily understood and enjoyed by both introductory students of oceanography and veterans of the science. For those who enjoy the challenges of mathematics, most chapters end with an appendix that provides quantitative and in-depth treatment of some aspect of the chapter.

In addition to a nontraditional treatment of ocean science content, Mark Denny's text reverses the trend in modern science textbooks of overreliance on pictures at the expense of content. Whereas this initially concerned me (my students do love pretty pictures!), the readability of the book and editorial style rendered a reliance on illustrations obsolete. I found Denny's presentation of the ocean systems to be a refreshing change from the standard textbook presentation. However, those intending to use the book as an introductory oceanography textbook should be aware that its coverage of certain aspects of oceanography is limited. For example, there is minimal coverage of tides and waves, ocean sediments, seafloor physiography, and benthic marine communities when compared to most introductory oceanography textbooks.

Overall, ***How the Ocean Works*** is a well written, thoroughly enjoyable book that comfortably bridges the roles of introductory oceanography textbook and fireside (or more appropriately, seaside) reading. Although its nontraditional coverage of ocean science may preclude it from use as the primary text in some classrooms, it will be a valuable resource for both teachers and fans of the world's oceans.

Peter Drzewiecki
Environmental Earth Science
Eastern Connecticut State University
drzewieckip@easternct.edu



BOTANY

Plant Form: An Illustrated Guide to Flowering Plant Morphology (Second Edition). By Adrian D. Bell. Line drawings: Alan Bryan. 2008. Timber Press. (ISBN: 978-0881928501). 432 pp. Hardcover. $39.95.

This book is a new edition of a book published by Oxford University Press. It is divided into two parts: Morphological Description, sorted by plant organ and followed by entries for specific groups (e.g., grasses and orchids); and Constructional Organization, highlighting meristems, development, and body organization. Part of the update of this book reflects the more recent articulation of basal dicots (*Magnolia,* etc.) from eudicots. While reading the text, I often found myself thinking that examples from the non-flowering plants would be illustrative. But the book clearly restricts coverage to the flowering plants.

Adrian Bell's writing about morphology is mostly clear and concise and the sketches by Alan Bryan are supportive of the text and are clearly labeled. Botanical vocabulary is often difficult or confusing for a student, but the good integration between text and figures is helpful. As might be expected of a book originally published in Britain, many British spellings are strange to American students (programme, liane, centre, colour, etc.). In some cases European terms are used rather than their North American equivalents (epicarp vs exocarp).

In seed morphology, the bean seed diagram, so commonly used in teaching, incorrectly labels the raphe as the micropyle (Fig. 195E). The author gives examples of fruits often confusingly called seeds; I would add Asteraceae as most students have seen bags of "sunflower seeds" containing fruits (cypselas) as well as true sunflower seeds at the salad bar.

The author has a detailed section on the special case of grasses. For years botanists left the study of grasses to the agronomists. As a result, a completely different set of virtually synonymous terms developed. Of course the structures and organizational details are unique to grasses, making the separation understandable. It is nice to have this section in this book as corn is often used in teaching.

However, the author states that the monocot cotyledon "does not contain stored food" (p. 198). In introductory biology courses, soaked corn "seeds" (yes, caryopses) are longitudinally bisected along the embryonic axis (the white "shield"). The cut surfaces of these halves are tested with iodine (I_2KI), and Sudan IV solutions. The students learn that the endosperm holds most of the corn starch, but the corn oil is mostly in the embryo, especially including the cotyledon (scutellum). The error by the author is repeated on p. 200 where it says that food is stored in the cotyledons of dicots only. Considering the importance of corn oil in human nutrition, this error deserves correcting. There are a few other examples this reviewer takes issue with, including the author's statement that the "cotyledon absorbs the endosperm when the seed germinates" (p. 198), and that the "coleoptile is regarded either as the second leaf or as part of the cotyledon itself." Of course we cannot assign to the author of this one book any culpability for confusion in the botanical literature.

The first section ends with a series of entries on plants that defy attempts to classify them within the "typical" plant framework. It is satisfying for a book to go beyond the easy common examples and present interpretations and questions that remain to be fully articulated. It sets a good example of what science is all about ... that our ideas remain open to reconsideration as new information and deeper analysis provide. The second portion deals with the constructional organization of plants. Phyllotaxy comes under this portion of the book. Relating botany (at some level) to math enables a teacher to demonstrate the Fibonacci series between two vertically-aligned leaves in a plant with spiral phyllotaxy. The number of leaves between them and the number of spiral gyres shown by the leaves between them are almost always members of the series.

The book includes a substantial reference section representing outstanding modern articles on plant morphology. These are integrated throughout the text and virtually every section has references to fairly recent literature on the subject. The author suggests this book is likely to be used as an illustrated dictionary. However the book is topically (rather than alphabetically) organized and the index at the end is shorter than is needed for such a term-laden book. Readers who at least have an idea of what a term pertains to might be able to quickly locate the pertinent section of the text; but for a beginning student, this would be extremely difficult. A book such as *Plant Identification Terminology* (Harris & Harris, 2001) would be a better first approach.

While this book stays with some confusing conventions in botany (fertilized ovules, scattered monocot bundles, etc.), it is a welcome addition to my collection. It cannot replace standard textbooks on plant morphology (Gifford & Foster, 1989), but it provides a nice vignette of each of the covered topics, with good illustrations and an integrated set of modern references. A faculty member can provide interested students with a germ of an idea and the "handles" needed to get into some pertinent primary literature to support an independent study in plant morphology.

Ross Koning
Department of Biology
Eastern Connecticut State University
Willimantic, CT
koning@easternct.edu

References

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