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## Essentials of Oceanography (Fifth Edition)

By Tom Garrison, Brooks/Cole Cengage Learning, 2008, 434 pages, ISBN 978-0-49555-531-5, Softcover, \$145.95 US.

REVIEWED BY THOMAS W.N. HAINE

Introductory marine science classes are tremendously popular on college campuses across the country. They can be superbly rewarding experiences for both students and instructors. Typically, these classes last for a single semester, and are based mainly on lectures, perhaps with a field trip to the coast, or coastal waters, where possible. Very little, if any, prior science knowledge is required, making the courses accessible to science and nonscience majors alike. Indeed, these classes are partly so popular because they deliver natural-science credits toward a nonscience major's distribution (general education) requirement.

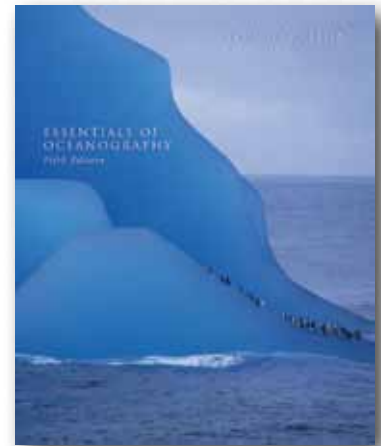
Apart from providing a valuable basic science option in the undergraduate curriculum, introductory marine science classes serve many other purposes. Students in these classes may not yet have declared their main fields of study, and can thus be recruited to departmental majors in oceanography, earth science, or environmental studies, for example. They may be upperclass students studying classical science or engineering disciplines who are potentially interested in graduate opportunities in oceanography or naval architecture. Or, they may be geoscience majors interested in the history of the ocean over geologic time, and are required to take the class for their own major. With enrollments often exceeding 100, this heterogeneity of the student cohort is typical, and diverse backgrounds, academic experience, and scientific ability are the norm.

Moreover, marine science is itself a disparate field. Academic oceanography

is the study of the marine environment and its interactions with the atmosphere, solid Earth, and biosphere. It is an interdisciplinary mix of physics, chemistry, and biology, and a prime example of an "Earth-system" science that emphasizes Earth as an integrated, complex entity that transcends traditional scientific boundaries. Marine science can mean much more than this narrow definition, however. It can extend to include environmental, social, and commercial issues, too, such as marine pollution, sustainable development of recreational beaches, and fishery management.

Given such a broad clientele, and such a wide range of potential topics to cover, designing a successful, balanced curriculum for an introductory marine science class is a challenge. And with so many interested students, a large market exists for freshman textbooks on marine science. *Essentials of Oceanography* by Tom S. Garrison is one of two books in this area by publishers Brooks/Cole Cengage Learning. The other one, *Oceanography: An Invitation to Marine Science*, also written by Garrison, is a longer version of the "*Essentials*" text.

Garrison, a regular contributor to these pages, is a distinguished educator with a manifest love for oceanography. His overarching aims in *Essentials* are to promote ocean literacy—the understanding of the two-way connection between people and the sea—and to stimulate long-term interest in the ocean, regardless of a student's major. Another aim of Garrison's book is to use the freshman oceanography class as an opportunity to introduce and explain the scientific method. Success in achieving these aims could be judged, for example, by the ability of his readers to grasp media reports on ocean science, and to make informed decisions on stewardship of the



marine environment.

The approach in *Essentials* is to provide a broad-brush, qualitative survey of marine science in 15 chapters and 400-some pages. The chapters are arranged in a phenomenological way, and can be read in (almost) any order; there is little accumulation of knowledge required as one works through the book. Two other common themes stand out. First, the book contains hundreds of photos, illustrations, and schematic diagrams. Almost every page contains a visual image of some kind. Second, a key strategy is to immerse the reader in oceanography through active engagement at every stage. The book achieves this approach using graphics, but there are several other ways, too: each chapter begins with an anecdotal preface of general interest, there are frequent "Study Breaks" that prompt students to review each subsection, and there are "Questions from Students" at the end of each chapter to give a different perspective. An extensive companion Web site also provides glossaries, flashcards, links to source material for every chapter, and many other study tools. Electronic slides and test questions are available for instructors.

The book addresses all aspects of marine science. Topics include the geological origin of seawater and the ocean basins, oceanic (and atmospheric) circulation, waves, tides, coasts, benthic and pelagic

ecosystems, and the history of oceanography. Evolution and natural selection are tackled, and the origin and history of life on Earth—mainly a story about marine organisms—are explained. There is also a long chapter on “Uses and Abuses of the Ocean,” which discusses exploitation of marine resources, anthropogenic impact on the marine environment, and global climate change. Links to relevant physics and chemistry are made where appropriate, although there are no connections to microbiology. Garrison’s text requires no prior knowledge of geoscience at all, so the genesis of our solar system is described, for example, as are spherical projections for chart making.

So, does *Essentials* deliver what it promises? Yes, by and large, it does. This book is strongest where it covers topics of recent public interest, like the 2005 hurricane season and the 2006 Indonesian tsunami. Here, one finds the most conspicuous changes from previous editions (four editions have appeared since 2001), although there are stylistic improvements as well. The book is beautifully illustrated, too. Oceanography instructors have access to such stunning, intriguing, and memorable images that it is a serious mistake not to exploit them in class. *Essentials* does not disappoint here, the visual standards are uniformly high. The pedagogy is also excellent. Garrison makes heroic efforts to facilitate student learning. The material is carefully paced and structured, and there are multiple review and self-assessment mechanisms to make the material stick. The author claims to have taught many tens of thousands of students, and it is easy to believe that every part of the book has been filtered through the collective undergraduate mind. As a consequence, there are no obvious omissions, and no obvious mistakes.

Although the text does not have any major weaknesses, it is not ideal for all

introductory marine science classes.

In particular, the educational style and level are not always suitable. Garrison rightly uses his subject to expound on the scientific method, and appeal to science-phobic students. But science doesn’t often work the way he writes in his book. Oceanography is a quantitative discipline, yet in *Essentials*, only two formulae are emphasized (on surface gravity waves), and no examples or questions involve numbers. Some topics seem obscure and ambiguous because they are handled in this qualitative way. For instance, the explanation of specific and latent heat capacities for seawater suffers because there are no numerical problems. There is no precise statement that heat energy is conserved either, which may further confuse students. Oceanography is also a hierarchical discipline in which knowledge progressively accumulates. For example, an accurate explanation of El Niño, or anthropogenic global warming, necessarily builds on basic (quantitative) understanding of Earth-system components. Garrison’s book does not present a layered intellectual challenge, and most students will find that they struggle to keep up with the material rather than understand it. So the danger exists that readers of *Essentials* will misjudge the nature of marine science, and the scientific method. The book is highly appropriate for students taking a terminal science class, but may well mislead those who plan to study marine science beyond freshman level.

Several other basic textbooks on oceanography compete for instructors’ attention today. These competitors are remarkably similar to one another, and to *Essentials* (a notable exception is the series of books by the Open University Oceanography Course Team). They often exhibit the same chapter structure, interchangeable images, and share anecdotes: see, for example, Spinrad’s (1996) comparison of seven of

these texts. This convergence of design and content is likely driven by the publishers and by student proclivities. Garrison’s text leads the pack, however, and, despite the reservations mentioned above, is an excellent choice for many introductory marine science classes. I should disclose that I have taught from older editions myself, on six occasions, having switched from Gross and Gross’s *Oceanography: A View of Earth* early on. I also regularly recommend Garrison’s book to students entering oceanography at the PhD or post-doc level, when remedial study on ocean literacy is needed.

With large enrollments and little assumed knowledge, students in introductory marine science classes sometimes feel anonymous, and may hope to slide by with minimal effort. Instructors can also sometimes feel pressured to entertain rather than to educate. A reliable textbook is critical to anchor such courses, and to provide an organized basis for learning. *Essentials* serves this purpose. But it exceeds being merely adequate via its clear vision, immersive style, high quality, and readability. Most importantly, the author’s enthusiastic love of oceanography shines through, and inspires the reader’s interest. Led by Garrison, even the most indifferent student will find it hard not to experience genuine wonder at the curious, fascinating ocean. ☐

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## REFERENCE

- Spinrad, R.W. 1996. The oceanographic text pattern: A review and comparison of introductory oceanographic texts. *Oceanography* 9(3):194–201. Available online at: [http://tos.org/oceanography/issues/issue\\_archive/issue\\_pdfs/9\\_3/9.3\\_spinrad.pdf](http://tos.org/oceanography/issues/issue_archive/issue_pdfs/9_3/9.3_spinrad.pdf) (accessed January 21, 2009).