areas (*e.g.*, Plate 42 Taiwan-Micronesia; Plate 30, the Indian Ocean-Africa; Plate 54, Western U.S. down to Tierra del Fuego). In other cases, curves seem to be grouped by overall shape, rather than geographic proximity (Plate 13, curve C; or Plate 23, curves and F and G). Some occasional errors occur (for example, Fig. 2-5 comes after Figs. 2-6 and 2–7).

Pirazzoli makes clear the limitations of the extant sea level data in pointing out the uneven geographical coverage (Table 3.1), and the large range in precision in collection and dating techniques. In the Introduction, Pirazzoli expresses the need for digitized sea-level data bases with more complete documentation of analytical techniques, and error margins. He cites some examples of existing data banks, such as the "Paleogeodesy" data base, compiled by the late W.S. Newman, the U.K. data base of Shennan, and others being assembled at the University of Lund, Sweden, and the Geophysical Institute of Kiel, Germany. In the conclusions, Pirazzoli furthermore recommends additional studies from data-deficient regions of the Southern Hemisphere. The creation of a truly global sea-level data base, with uniform standards and quality control, will represent a major advance in Holocene sea level research, and will become an indispensable tool in studies of crustal isostatic movements, neo-tectonic activity and paleoclimate change.

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Ecology of Sandy Shores, A.C. Brown and A. McLachlan, 1990. Amsterdam-Oxford. New York-Tokyo: Elsevier, 328p. ISBN 0-444-88661-3.

Two South African authors (respectively, universities of Cape Town and Elizabeth Port) have collaborated to present us with this unusual book. Another surprising element is they are both zoologists. So many biologists in the late 20th Century have been seduced by the charms of genetic research and non-field-related activities that ecology has reverted almost entirely to botanists, geomorphologists and physical geographers. Neveretheless, our two zoologists have done a superb job of presenting the whole field in a well balanced way.

In reviewing a book, this particular writer has a rule of thumb: after a quick glance at the Table of Contents (4p., about 150 entries: good!), he turns to the Index (about 300 entries: O.K.!), and References (about 600: excellent!). So we are starting out on the right foot. Brown's own citations are mainly zoological but include ecological papers and oil-pollution results. McLachlan's are rather similar but more ecological and he (with T. Erasmus) edited a collective volume on "Sandy Beaches as Ecosystems" (The Hague: W. Junk Publ., 1983). He has also contributed to the *Journal of Coastal Research.*

To convey some idea of the book's scope and emphasis, the 13 chapters will be touched on, one by one. Each is identified by author's initials, some of them jointly. Chapter 1, an Introduction, spells out the book's objective: "to present a more balanced and integrated account of sandy-shore ecology than has previously been possible", with every component from surf-zone to dune considered as part of a single system, including management of that system. In a quotation from a 1942 paper these unique landforms are described biologically as "great digestive and incubating systems", which are hardly the words that the average geomorphologist would use to describe them, although undoubtedly true. It is salutary to get a different perspective!

Next, Chapter 2, gives us the Physical Environment (34p.), with a brief petrographic treatment of sand granulometry, Stokes Law, Phi units and porosity, going on to waves, refraction, shoaling, beach types, bars, rips, and exposure rating. The geologist misses any mention of either physical or biogenic structures. How does the paleoecologist recognize a "fossil" beach? And distinguish it from an eolianite? The South African coast is richly endowed with these informative features.

Chapter 3 provides space for the Beach Flora (10p.), which is understandably scant. In contrast, Chapters 4 through 8 (137p.) treat invertebrate faunas, their adaptations, communities, with appropriate attention to the rhythms forced by seasonal, circadian and tidal changes. Birds and other non-marine vertebrates are touched on in Chapter 9 (8p.).

One of the most interesting chapters, to this reviewer, is Chapter 10, Sandy Beach Ecosystems (29p.) with the food chains and energy flow. Chapter 11 gives timely attention to Pollution (15p.).

The Dunes (Chapter 12, 25p.) receive deserved

attention, and the final segment (Chapter 13, 23p.) wraps up to overall problems of management, man-made stress, control and restoration. One thing that would make this volume a good textbook for any university course dealing with the coastal environment is the thoughtful provision of a couple of pages at the end of each chapter, summarizing the key points. The work is thoroughly recommended.

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Handbook of Dredging Engineering, J.B. Herbich, 1992. New York: McGraw-Hill, 756p. ISBN 0-07-028360-5.

The *Handbook of Dredging Engineering* is an extension and update of the book *Coastal and Deep Ocean Dredging* authored by Dr. Herbich and published in 1975. This new handbook contains a majority of the available information relating to dredging for easy reference by engineers, scientists and managers of dredging companies and federal and state regulatory agencies. It will also be a valuable reference or text for academic courses dealing with coastal process and dredging engineering in curricula for ocean and civil engineering.

The book opens with a brief history of dredging, description of the major dredging literature sources and a brief review of basic fluid mechanics. Dredging involves the removal of sediment from navigational channels, ports and harbors and the placement of the sediment or dredged material at inland or offshore disposal sites. Dredged material is located at the bottom of water bodies such as rivers, lakes, waterways, bays or oceans, and its removal frequently involves the use of a centrifugal pump (dredge pump) to move the sediment/water slurry. There is extensive discussion of dredge pumps including theory, application, performance, and cavitation. This is followed by a discussion of dredging equipment including mechanical and hydraulic dredges. Sediment characteristics and their transport through pipelines is addressed. Cutterhead dredging, ocean dredging, beach replenishment and low cost maintenance dredging are described as part of a dredging methods discussion.

Extensive discussions of dredged material placement and disposal and the environmental effects of dredging are contained in two chapters with contributions from experts in areas of confined disposal facilities, water quality aspects, open water disposal, dredged material islands for wildlife and dredging contracts. Current dredging instrumentation and automation technology are discussed including expert contributions on automation, surveys and production meters. Finally, planning of dredging projects is addressed which includes bidding costs, federal projects, environmental impact statements and other requirements. Appendices describe conversion factors, physical properties, government regulations, dredging engineering manuals, containment area example calculations and a description of the U.S. Army Corps of Engineers' Dredging Research Program.

A subject and author index and a detailed table of contents make for easy access to subjects of interest to the reader of this well organized handbook. Ten experts in their specialty field related to dredging have contributed to the text to augment Dr. Herbich's acknowledged expertise in dredging. Some of the material is the result of his 25-year involvement in dredging through the annual Dredging Engineering Shortcourse, annual Dredging Seminar in cooperation with the Western Dredging Association, the Center for Dredging Studies at Texas A&M University, and his teaching of a graduate level marine dredging course. The handbook is well written and supplemented with numerous graphs, and it will be a valuable reference for industry, government and academic institutions.

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