level. The author's stated objectives are "to present first a discussion of the physical processes involved in ocean wave mechanics and second the analytical basis of these processes at the level required by the marine engineer and scientist". This reviewer concludes that these objectives have been well accomplished and that through an understanding of the material and the references provided for additional reading, this book provides a good basis for a practical understanding of water wave phenomena and their engineering applications. It is most suitable for an engineer or engineering student needing a working knowledge of the subject that does not require application to situations not covered or to further theoretical studies of water waves.

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Geomorphology of Rocky Coasts, by Tsuguo Sunamura, 1992. John Wiley & Sons, Ltd., Chichester, U.K., 302p. ISBN 0-471-91775-3.

This book, representing the third volume in the Coastal Morphology and Research Series, examines rocky coasts from an engineering, as well as a geomorphological perspective. The book begins with a brief review of wave dynamics, tides, and rock mechanics (chapters 2–4), which forms the physical basis for an understanding of cliff recession (chapter 5) and bedrock lowering (chapter 6). Following the discussion on erosional processes, characteristic rocky coast landforms are described (chapters 7, 8). The final chapter reviews the impacts of human activity on rocky coasts, including effects of future sea level rise on cliff erosion. The book features an extensive bibliography (28 pp.) and a global compilation of coastal cliff recession rates which can reach up to 30–40 m/yr in unconsolidated glacial clays and pyroclastics.

An important theme throughout the book is that rates of cliff erosion or submerged bedrock lowering are governed by two competing forces: the attacking force of waves, Fw, and the resisting force, Fr, determined by the rock mechanical strength. Mathematical relations between relevant parameters are developed, based on field and laboratory measurements. While the wave assailing force, Fw, is directly related to wave energy, it also depends on the nearshore bottom topography, presence of beaches, and water level, including tides, and surges. Because of the complexity of the problem, no quantitative index for Fw has yet been established. However, the compressive strength of rocks has been used as an index for the resisting force, Fr.

Erosion rates vary considerably over time and space. Short-term recession, caused by major storm events, is much greater than the long-term averages. Lithology exerts a strong influence, too: rates are as low as 10^{-1} m/yr in granitic rocks to ~10 m/yr in unconsolidated volcanic ejecta. Where lithology is similar, erosion rates vary, depending on wave conditions. The strength of cliff material also determines the relation between erosion rates and beach elevation. Over short time spans, erosion rates are affected by cliff height, but this relation becomes less pronounced as the time span increases. Lowering of seafloor profiles is also examined (chapter 6). Important controlling factors are the depth of the sediment cover, bedrock lithology, including physical discontinuities (fractures, joints, bedding), and biological activity (grazing and boring organisms).

A two-fold classification of the cliff-ocean interface is presented: 1) cliffs with shore platforms, and 2) plunging cliffs (chapter 7). The former is further sub-divided into two classes: Type-A platforms, with a gentle seaward slope, and Type-B platforms that are horizontal, with a sharp seaward drop. Models of platform development are reviewed. Sunamura proposes a complex physical model for rates of recession for Type-A and Type-B platforms, and also examines relations controlling platform elevation and width. These are then integrated into a rocky coast evolution model for periods of prolonged sea level stability. Widespread applicability of his model may be limited by the large number of parameters, and constraints of data availability.

Plunging cliffs are formed by drowning of preexisting, wave-formed cliffs, due to land-subsidence and/or the post-glacial marine transgression. They can also be associated with neotectonic activity, including faulting and volcanism. While cliff submergence is a prerequisite, their preservation implies a sufficient rock strength to resist erosive wave action, during a sea level stillstand.

Selected erosional landforms are discussed in chapter 8. These include notches, sea caves, sea arches and stacks, ramparts, ramps, potholes, solution pools, tafoni (hollows or cavities in rock), and honeycombs. Notches are potentially useful as paleo-sea level indicators, but their interpretation as such requires careful understanding of their mode of origin, which includes chemical solution, mechanical erosion (wave action, abrasion), and/or bio-erosion. While most notches lie at or above mean sea level, some also lie below. The wide vertical distribution suggests considerable variability in wave energies and tidal ranges. Sea caves, arches and stacks form in weaker rocks, the erosion of which is often controlled by planar elements, such as bedding planes and fractures. Coastal tafoni often develop on arkose or sandstone, usually above the spray zone, whereas honeycombs, with a cell-like structure, form within the spray zone, above HWL. Their worldwide distribution is tabulated.

The last chapter examines the impacts of anthropogenic activity on rocky coasts. After a brief survey of different types of protective engineering structures, the consequences of these on cliffed coasts are examined. Sea walls are subjected to scouring at their base. Rigid sea walls may further enhance bedrock lowering. Basal scouring may ultimately undermine the stability of the structure. Engineering works, such as breakwaters or jetties, may interrupt littoral drift, depriving the downdrift side of sediment. If this causes depletion of beach materials in front of a cliff, an intensification of cliff erosion is likely. Construction of dams or reservoirs, and also beach mining all tend to reduce the sediment supply to the coast. Cliff slope instability is promoted by construction of buildings and roads too close to the cliff edge, a common problem in places like California. Removal of the natural vegetation cover is another destabilizing factor. Cliff erosion, especially where associated with Type-A platforms, is likely to increase with rising sea level. Using a simple mathematical model, Sunamura estimates up to a doubling of the recession rate for a small Pacific volcanic island, by the year 2100.

In contrast to most previous descriptive accounts of rock coastal landforms, this book presents a more quantitative treatment supported by laboratory experiments and field observations. This viewpoint provides a much better understanding of the dynamic forces, both attacking and resisting, that shape rocky coasts. As such, the book makes a valuable contribution to coastal geomorphology. A few minor points could have been improved. Parameters on Figs. 7.5–7.7 could have been defined in the captions. The title is also somewhat misleading, in that "rocky" is essentially equated with "cliffed". The author's definition of a rocky coast is one that is "cliffed and yet composed of consolidated material irrespective of its hardness", including soft, cohesive, but *unconsolidated* materials, such as clay, sand, pyroclastics (see Appendix Two). While the latter materials may well form cliffs, they are not usually described as "rocky".

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Coarse-Grained Deltas, edited by Albina Colella and David B. Prior, 1990, Blackwell Scientific Publ., Oxford, etc., 357p, 392 figs. (pounds sterling 40.–). (Spec. Publ. 10, International Association of Sedimentologists). ISBN 0-632-02894-7.

This is a symposium volume consisting of 19 articles by 29 authors. It arose largely as the product of the First International Workshop on Fan Deltas that was held in 1988, sponsored by the University of Calabria, Italy. Coastal specialists will be interested in this volume because it deals in some detail with deltas mainly of the Gilbert type and vastly different in many respects from the classical muddy deltas familiar to students of the Mississippi, Nile, Po, Danube, etc.

The delta concept and its various classifications are treated by W. Nemec (Bergen) and a new and original system for alluvial deltas is presented by G. Postma (Utrecht). For students of ancient deltas it is essential to try to avoid generic definitions because, although the regional forcing conditions are a legitimate criterion for categorizing modern deltas, when we have to face up to limited data and the regional inferences involved in analyzing any ancient geological examples, assumptions and subjective judgments tend to mount up. Criteria based on purely sedimentologic data offer a more secure procedure. This is especially true because ancient deltas are often long-lived and vary in form and characteristics through time. This volume focuses on sand-to-gravel grain sizes combined with steep slopes at the delta face. The