provides a perspective on ancient environments for more specialized structural researchers; who, in the course of their work, would have become aware of the material in the final section on plate tectonics and sedimentation. The approach of the book is original and welcome: it describes the sedimentary processes and products from different plate-tectonic environments. One use for this book is to assist field geologists identify the likely tectonic setting and field relationships of deep-water rocks. Destructive or oblique-slip margins, in particular, can juxtapose rocks from a wide-range of plate-tectonic settings. This book presents a wide repertoire of sedimentological models, and data from a range of modern settings, to suggest how they might relate. Structural geologists working on deep marine rocks should be aware of this information. The book has an accent on siliciclastic sediments, but is applicable to carbonate and more mixed environments.

A history of the investigation of deep-marine environments forms the first chapter. The remainder of the book is divided into three parts. The first part considers sediment transport and deposition in deep water, deep-water facies and depositional processes. The nature and products of high-density, bouma-type and low-density turbidity currents; debris flows; contour currents and sediment-slides, are all considered in Chapter 2. This chapter provides a useful review of sediment gravity flows in particular. In Chapter 3, which is particularly applicable to anyone wishing to describe deep-water sedimentary rocks in the field, the reader is introduced to a comprehensive facies classification scheme, which is illustrated with photographs, and referenced, to facilitate comparisons. The final chapter introduces many of the controls on sedimentation: variations in the CCD and sediment supply, sea-level changes and the importance of glaciations and ridge-volumes and intraplate stresses. It ends with a brief account of the effect of oceanic circulation patterns and the identification of, and possible significance of, changes in bed thickness and grain-size. These topics are not dealt with in any depth, and cover topics which are outside the scope of most field structural studies.

The second part of the book describes slope aprons (and continental slopes in particular), submarine canyons and valleys, submarine fans, sheet sedimentation on the abyssal plains and in trenches, and contourites. There is considerable information in this section which gives the reader a good impression of what sediments from these various settings are like, which makes this section useful reading. Chapter 5 describes many types of passive and active continental margins, including the effects of sea-level change and slope failure. Chapter 6 concentrates on the origin of modern submarine canyons, but does mention some ancient examples. The processes operating in, and nature of, modern fans are described more fully in the next chapter, together with some ancient examples of submarine fan deposits. This is followed by an account of modern abyssal plains (probably too short), trench and fore-arc/back-arc basin floors and a description of some ancient sheet systems. The final chapter on contourites concentrates on modern examples, because of the scarcity of reliable examples in the geological literature. They are included because of their palaeoceanographic significance, and since continental rise successions influenced by contour-current or bottom-current processes lack good reservoir rocks.

The three chapters comprising the final part of the book describe sedimentation on evolving and mature passive margins, active convergent margins and oblique-slip continental margins. This section concentrates on briefly reviewing the tectonic context of sedimentary basins, and is the least useful in the book. Although difficult, some review of which sedimentological characteristics distinguish these environments would have been useful. To describe sedimentary basins in their plate tectonic context is not the same as a discussion of how sedimentation is controlled by tectonic processes. This question may be a difficult one. Different environments affect provenance and facies geometries. However the answer may be 'not much!'; but no reply is given in this book. Lacking this sort of overview, sedimentological and tectonic processes remain poorly integrated, despite this being one of the claims on the fly leaf. What is presented is more of a compilation than a critique or review. The specialist structural geologist will learn little new about tectonics from this section, although it would be useful to third-year undergraduates wishing to read a short account about these regions. The chapter on passive margins concentrates on reviewing the Atlantic margins and northern North Sea, but includes a Tethyan example of a Jurassic passive margin from the Italian Alps. The next chapter considers fore-arcs, back-arc/marginal basins and marine foreland basins. After describing the variation of trench-fill sediments, fore-arc and trench-slope basins, a brief account of back-arc basin sedimentation is included. The section on accretionary environments is continued with short accounts of the modern North Fiji basin, Lesser Antilles, Middle America, and Peruvian marine and north-west Pacific; and concluded by a mention of the Chugach Terrane and Shimanto Belt, with the Timor-Taminbar and south-west Pyrenean foreland basins as examples of deep marine foreland basins in a continent–continent collision zone. The final chapter on oblique-slip continental margin basins uses modern examples from the Andaman Sea, Hikurangi Trough and California, and ancient examples from the Pyrenees and Britain/Newfoundland, to illustrate oblique tectonics. This final chapter is probably the least satisfactory of the three: it lacks significant discussion of pull-apart basins, and concentrates too heavily on a review of regional tectonics.

On balance there is much useful material in this book for undergraduates, postgraduates and specialist researchers. Almost every illustration in the book is clear and useful, despite having a variety of styles and sources. The text is clearly written, and given the length of the book and quantity of illustrations, covers subjects in as much depth as possible. The paperback edition is securely bound, and represents good value.

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Caribbean tectonics

Mann, P., Draper, G. and Lewis, J. F. (editors) 1992. *Geologic and Tectonic Development of the North America–Caribbean Plate Boundary in Hispaniola.* Geological Society of America Special Paper 262. 401 pp. + five plates in slipcase. Price $98.75.

Reading through this Special Paper is like taking a semester seminar in the geology of Hispaniola. (Unfortunately it took me that long to finish this review!) The book includes 18 substantial papers, maps as both page-sized sketches and folded plates (but no colored maps), satellite and aerial images, stratigraphic columns, fossil lists, and many other extras. The main authors are the editors and their students. Coworkers Fred Nagle, James Joyce, Jim Pindell, Steve Kesler, Terry Edgar, Marge Winslow, Bill McCann and W. A. van den Bold contribute nine papers partly or completely.

The first two papers, by the editors, give an overview of Hispaniola's place in the Caribbean tectonic framework, and discuss the island's metamorphic core. Serious attempts are made to sort, classify and describe all the diverse tectonic and stratigraphic elements that make up Hispanola. Some of these do not seem to agree with each other, but largely the conflicts seem to be problems of usage and vocabulary. The metamorphic belts and structures of northern and central/southern Hispaniola are related to each other, and to the geologic development of a deep-sea trench and island-arc rocks of a subduction zone. This is done well and should serve as a model for other plate boundaries. As ever, the more work is done, the more complicated are the models and explanations.

Joyce describes high-pressure metamorphism near the north coast of the island, relating metamorphism to collision with the Bahamas Platform. Metamorphic ages show that collision began in the Late Cretaceous and ended in the early Tertiary. Detailed structural analysis supports the metamorphic evidence. Draper and Nagle, and Pindell and Draper, review and extend their work in the Puerto Plata area and elsewhere on the north coast, begun by Nagle years ago in his work in the Hess Caribbean Project. This is a structurally complex, poorly exposed area of melange and diapiric movement. Many loose ends still remain, but the concepts of serpentinite protrusion and diapirism have given us a good model to follow. The recognition of serpentinite conglomerates, sedimentary deposits of largely serpentine composition, allows the understanding of several difficult regions. Local stratigraphic names impede quick comprehension, but there is no other way to present the topic.

Two papers by John Lewis and coworkers present detailed petrography, petrology and geochemistry of the metamorphic Duarte Complex, and stratigraphy of Cretaceous (Tireo) volcanic rocks in the same region. They suggest an early island-arc or seamount environment, with Cretaceous volcanism as part of an extensional episode.

Steven Kesler and coworkers have four papers on tonalite and other igneous rocks focusing on K/Ar ages related to arc and plate models, two Late Cretaceous volcanic units (Maimon and Los Ranchos), and an epithermal gold deposit (Pueblo Viejo) in a maar/diatreme complex. The volcanic units represent contemporaneous seamount and

island-arc settings, and another unit (Amina) is the detrital, oceanward equivalent. They also believe that the volcanic rocks correlate with 'middle island arc' rocks in Puerto Rico and the Virgin Islands, building the island arc up to sea level but emplaced on 'already thickened crust'. This may be the first suggestion that island-arc volcanism began before the early Late Cretaceous in the eastern Greater Antilles.

Paul Mann and his coworkers have contributed four structural papers and one biostratigraphic paper, Margaret Winslow *et al.* a structural paper, and Terry Edgar a structural/seismic reflection paper. A 22-page appendix to the Dolan and Mann paper, by Simonetta Monechi, presents primary nannofossil biostratigraphic data for Paleocene to Miocene units. These seven papers form part II of the volume. Many of the structural details are worth notice. Dolan *et al.* use sedimentary features such as current directions to show deposition parallel to present-day fault trends, suggesting that faulting and deposition were contemporaneous. De Zoeten and Mann give a beautiful example of strain within a 15-km-wide left-lateral fault zone. Edgar studies seismic reflection profiles across the Cibao basin, supporting dominant left-lateral strike-slip motion with a strong compressional ('transpressive') component. Winslow *et al.* look at a single uplift within the Cibao basin, showing the compressional and strike-slip details. The Late Miocene, Pliocene and Pleistocene deformation and uplift in northern Hispaniola are nicely documented.

Heubeck and Mann document four pulses of deformation from Late Eocene to Late Pliocene in a well-illustrated detailed structural study, especially in a block diagram showing suggested relations between the Beata Ridge and central Hispaniola. East–west plate motion in and near Hispaniola precedes but continues during a pulse of northward motion of the Beata Ridge into southern Hispaniola, creating a complex mix of compressional and transcurrent structural features. More current-direction evidence along with water-depth and paleo-environmental data are used by McLaughlin *et al.* to study Neogene rocks in south-central Hispaniola. The final paper by Mann *et al.* focuses on structure and tectonics of the same area as the preceeding paper, with a nice display of LANDSAT images and their structural interpretations. They present abundant evidence that the major southern basins (Cul-de-Sac and Enriquillo) are ramp basins, similar to rift valleys but with bounding reverse faults dipping away from the basins. Again, they invoke transverse compression (transpression).

In general, this book is a valuable document. It gives abundant detailed evidence for many structural and stratigraphic conclusions about Hispaniola and the northern Caribbean, the result of 10 or 20 years of field work by a large squad of geologists. The overall model is that of plate tectonics, obviously, and there is some temptation to disappear into the jargon of modern geology, but a small amount of attention by the reader can bring great dividends. Hispaniola is the heart of a complex, mature island arc. It still has features of its early history that will be obscured by collision when the modern Atlantic Ocean finally disappears at the end of the Wilson cycle. Inferences and conclusions about paleogeography, order of events, stresses imposed and the resultant strains in Hispaniola can be applied to collision mountain ranges like the Himalaya or earlier Tertiary or Paleozoic suture zones.

The book should be valuable for students of the Caribbean or of mountain-building anywhere. Much of it is accessible to advanced undergraduate or graduate students, and professional researchers can find many examples of structural processes and stratigraphic relationships useful for research or teaching. As usual, the book is expensive, but it is well printed and my copy hasn't broken yet, so the binding must be strong. There are the usual small number of typos and confusions, mostly between figures, their captions, and the text, but they only challenge the reader to stay alert.

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