The remainder of the book, in fact the majority of it, consists of ten appendices. Appendices 1, 3, 4, and 5 are computer printouts of artifact tallies. Although Blanton must be commended for publishing all his data, the information tabulated in these sections is regrettably not readily usable. Funds would have been better spent in distributing copies of the original master tape than in publishing the data in tabulated form. The descriptions of ceramic types (appendix 6) are also very difficult to digest, unless one has a copy of *La Cerámica de Monte Albán* handy. No illustrations of vessel forms accompany the text, another important drawback. Appendix 7 comprises a set of 1:2000 grid maps on Monte Albán. The drawings unfortunately are quite amateurish and add no new information, save for terrace numbers. Appendix 8 (figurine and urn fragments), appendix 9 (terrace 1227 excavations), and appendix 10 (structure summary) do provide useful, in some cases provocative, data on a variety of subjects, however.

What then is the value of Blanton's study? Although we think his theoretical position is untenable, his period-by-period descriptive accounts of the history of the city are of considerable value. Blanton is at his best in describing the Period III city. The descriptions of the main plaza and the various site divisions are a masterly piece of archeological reporting.

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Earth Processes

Island Arcs, Deep Sea Trenches and Back-Arc Basins. Papers from a symposium, Harriman, N.Y., March 1976. MANIK TALWANI and WALTER G. PITMAN III, Eds. American Geophysical Union, Washington, D.C., 1977. x, 470 pp., illus. $16.50. Maurice Ewing Series 1.

Because ocean floor is created much faster than any areal increase due to global expansion—if such expansion occurs—the earth's surface area must decrease elsewhere at a similar rate. At the present time the decrease takes place mainly by subduction of old ocean floor at active continental margins and island arcs. The idealized subduction zone has a trench some kilometers deep at the surface and a seismically active zone dipping at 45° under the continental margin or island arc, with andesitic volcanoes some 100 kilometers from the trench. Active arcs commonly have actively spreading small ocean basins—"back-arc basins"—behind them.

This symposium volume, the first of a planned biennial series to honor the late Maurice Ewing, discusses a much greater range of island arcs, active continental margins, trenches, and back-arc basins than is suggested by the idealized model. As a result it will probably sweep away some pre- and misconceptions, but it will not replace them by an overall synthesis; exploration, discovery, and speculation are the keynotes of the book.

Multichannel reflection seismology is a relatively new powerful technique. Several detailed surveys reported in the book show its capabilities, providing what are essentially cross-sections through the upper few kilometers of submarine rock. However, the interpretation of the profiles is still controversial. For example, are the sediments in the deformed wedge landward of a trench scraped-up ocean-floor material, or are they deformed lower-trench-slope sediments? An understanding of their nature may help with understanding why the Mesozoic continental margin of California has accreted sediment whereas that of southern Peru has not.

Even today, volcanicity is unevenly distributed along actively subducting margins. Far fewer active volcanoes lie in the 3000-kilometer subduction zone from the Marianas Trench to the Bonin Trench than in the zone to the north. The South American margin even has stretches where there are no Quaternary volcanoes at all alternating with stretches with active volcanoes. Volcanicity along the subducting Aleutian arc is absent where the slip vector is at an angle of less than 35° with the trend of the arc. Several papers speculate that factors such as stress, subduction-zone dip, thickness of sediment being subducted, water content, and thickness of the asthenosphere play some role in causing these variations. If volcanoes need not accompany subduction for long periods, then the geologist's task of recognizing and interpreting ancient subduction zones is even more perplexing than it already appears.

The simple subduction model suggests that as the lithosphere bends into the mantle the upper part will stretch and the lower part will shorten, like an elastic plate. Exactly the opposite stress orientations have been found in parts of the sinking Pacific and Nazca plates, perhaps reflecting an elastic "unbending" after an initial plastic deformation.

The later Cenozoic ridge-trench collision off California produced the notorious San Andreas Fault system. One possible indication of what happens next, geologically speaking, is suggested by the older ridge-trench collision in the Aleutian Islands: renewed subduction some 15 million years in the future.

How back-arc basins form is not yet known. Wherever direct drilling evidence exists all such basins have formed by the migration of a subduction zone oceanward from a preexisting continent or island arc. Indirect evidence, such as magnetic anomalies and heat flow, shows that most of the remaining basins have a similar origin. The great exception is the eastern Aleutian basin, striped with anomalies believed to be of M1 to M13 age and interpreted as trapped oceanic crust—but it would be reassuring to have drill cores to prove it.

The great strides made in geology in the last two decades are apparent if one recollects the widely acclaimed "Crust of the Earth" symposium held to celebrate the 200th anniversary of Columbia University. The recent revolution owes much to the work of Maurice Ewing and his collaborators at the Lamont-Doherty Geological Observatory of Columbia University. This volume is a fitting memorial to Ewing and an excellent beginning to the planned symposium series.

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