fertility and high mortality will be replaced by low fertility and low mortality, although not necessarily in that order. A second assumption is that change to a diet higher in refined sugar, salt, and saturated fat, combined with decreased physical activity, will lead to increased fatness and the appearance of "modern" chronic diseases, such as diabetes and heart disease. The role of stress generated by rapid change in this process is also acknowledged, but rarely defined.

The Samoan studies described in this volume set out to investigate this scenario in detail. Although modernization is not explicitly defined, a gradient from least to most modernized is established at the population level, from Western Samoa, with relatively little outside contact, to American Samoa, site of American military bases during World War II, to migrant populations in New Zealand, Hawaii, and California.

Virtually every aspect of Samoan biological and cultural responses to this gradient of modernization is described in one chapter or another, with the interesting theme that Samoan cultural, demographic, and biological responses do not exactly fit the pattern followed by most other modernizing populations. Demographically, fertility has remained high, even with decreased mortality and limited physical resources. Samoans export their excess population to other countries. The value of numerous offspring is maintained because migrant workers return money to their families in Samoa.

The physiological responses of Samoans to a high-fat diet and reduction in physical activity are also different from those found in other populations. Chapters by Bindon and Zansky on body composition in children and by Pawson on the morphology of adults show that fatness has increased even in infants and many Samoan adults are distinctly obese. Yet the blood lipid studies summarized by Pelletier and Hornick conclude that mean serum cholesterol levels and the incidence of cardiovascular disease are much lower than expected on the basis of the experience of other groups. Triglyceride levels, on the other hand, are comparable to those in other populations undergoing modernization.

The effect of modernization on blood pressure is clearly shown in the chapter by McGarvey and Schendel. Mean blood pressure rises with exposure to modernization. Samoan blood pressure is also significantly affected by fatness, salt intake, and psychosocial factors such as education and occupation (and status incongruity between the two), family size, and expression of psychological complaints as measured by the Cornell Medical Index.

Although modernization appears to be causing an increase in Samoan blood pressure, fatness, serum triglycerides, and psychosocial stress, mortality studies in American Samoa and the United States indicate that the rate of deaths from heart disease is lower than would be expected. The authors offer two possible explanations for this phenomenon. Either Samoans have different physiological responses to the stresses of modernization or the stresses must be present from an early age in order to affect mortality from heart disease, and thus have not yet been expressed in the population. Of course, the possibility of underreporting must also be considered.

The enigma of Samoan resistance to coronary disease is not resolved by the studies presented in this book. Rather, the various psychosocial stresses, nutritional factors, and decline in physical fitness are painstakingly documented in an effort to eliminate the obvious explanations. Genetic adaptation may play a role, given that the degree of obesity declines with non-Samoan admixture. Long-term adaptation to high dietary fat intake may also exist, because Samoans traditionally consumed a diet high in saturated fats, owing to extensive use of coconut oil.

The chapter authors and editors are forthright in their own assessment of the studies conducted, pointing out problems due to multiple observers, missing pieces of data, and changes in research design necessitated, for the most part, by human factors. Although the reader may feel frustrated that certain key elements remain to be studied so that a definitive picture of Samoan biocultural adaptation can be painted, one can gain from this book a greater appreciation of the pitfalls and rewards of doing anthropologically oriented research.

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Far-Traveled Terranes

Tectonostratigraphic Terranes of the Circum-Pacific Region. DAVID G. HOWELL, Ed. Circum-Pacific Council for Energy and Mineral Resources, Houston, TX, 1985 (available from the American Association of Petroleum Geologists, Tulsa, OK). x, 585 pp., illus., + loose map. $32. Earth Sciences Series, no. 1. From a meeting, Stanford, CA, Aug. 1983.

For the past six years, geologic terranes have been the subject of much discussion and debate among earth scientists and the focus of numerous scientific meetings. This enormous volume was the outgrowth of one of these gatherings, the Second International Meeting on Circum-Pacific Terranes. (A detailed report by Richard Kerr on the meeting was published in *Science* 7 October 1983, pp. 36–38.)

The volume consists of 42 papers divided into five sections. The first section is titled Principles and Applications of Terrane Analysis and comprises five papers, but only the opening summary paper by Howell and colleagues and the paper on terrane dispersion by Crowell readily fit under this heading. The papers in subsequent sections are subdivided by geographic location and cover the Pacific Northeast (19 papers, including 5 on Alaska, 8 on California-Oregon, and 4 on peninsular California and Mexico), the Pacific Northwest (3 papers on Japan and 2 each on the Philippines, northeast Asia, and China-Taiwan), the Pacific Southwest (6 papers on southeast Asia, Australia, New Zealand, and Antarctica), and the Pacific Southeast (3 papers concerning a small island offshore of Colombia, Andean evolution, and Antarctica). The papers range from presentations of new research and new thorough reviews to recyclings of previously published studies in the new terrane terminology (for example, terrane "docking" and "dispersion," "pluton stitching," "provenance linking"). The authors are a mix of old pros and newcomers. The volume is well produced and will serve as an excellent source of basic geologic information and references for the geology of much of the circum-Pacific region for a long time to come.

At the time the meeting was held, enthusiasm was spreading rapidly through the earth sciences community—and even to the popular literature and television—about terrane analysis and conclusions from it concerning the shape and size of continents. The first paragraph of the volume's preface, written by Howell, identifies what seems to have been the principal cause of the excitement: "The modifier 'tectonostratigraphic' specifies that a terrane is defined on the basis of stratigraphy and that its position and dimensions result from tectonic processes involving dislocations of tens to thousands of kilometers." The theme that many of the terranes of the circum-Pacific region may have moved long distances (hundreds of kilometers or more) before collision with and accretion to a continent is implied by most and directly stated by several contributors. The volume would have been greatly strengthened by the inclusion of a brief concluding chapter that explicitly identified all the terranes around the Pacific for which there are hard data indicating that such movements occurred.

"View along strike of the Sierra Placeres melange showing block of massive serpentinized harzburgite enveloped in a steeply tipping foliated serpentinite matrix." Such blocks are thought to be tectonic fragments from the adjacent Vizcaino Norte and Vizcaino Sur terranes. [From the paper by T. E. Moore in *Tectonostratigraphic Terranes of the Circum-Pacific Region*]

The papers make it clear that the gist of terrane analysis is the tabulation of cross-cutting structural relations, isotopic and paleontologic ages, and physical conditions during metamorphism, as well as of data from provenance studies of sedimentary rocks, paleomagnetic analyses, and basic field geology and routine laboratory analysis. The primary objective of this work is to identify differences between juxtaposed terranes. The next problem, of course, is whether the differences in sediment composition, metamorphic history, or magnitude of penetrative deformation result from differing processes in the same tectonic setting with less than a few tens of kilometers of relative motion or in geologic settings once widely separated.

Interpretative diagrams ("Dewey-grams") based on plate tectonics help conceptualize the nature of many of the stratigraphic, structural, and metamorphic differences that can develop between terranes that formed and evolved at a convergent, divergent, or conservative plate margin (the last, as discussed in the paper by Crowell, being a tectonic setting where shuffling of highly disparate terranes along faults with only modest offsets is likely to become extensive). Admittedly, such diagrams are simplistic and have many shortcomings resulting from our lack of understanding of the factors and processes that control the tectonostratigraphic evolution of a plate margin. But their scarcity in the papers greatly hinders a reader's recognition of the geologic and geophysical relationships that can be explained without appealing to long-distance movement, as well as impeding the direct comparison of the papers with those written by other workers on the same region.

In sum, the book does not make clear to this reviewer why "terrane analysis" is endorsed by some workers as heralding a breakthrough in our understanding of the continents. The idea that terranes (for example, seamounts or oceanic island arcs) can move long distances before accretion to a continent is not new. How does the thinking of a terrane enthusiast in the 1980s really differ from that found in the publications of Hamilton, Ernst, Dickinson, Page, Yeats, Dewey and Bird, and numerous others during the late 1960s and early 1970s? The contributors to this volume have simply put the regional geology of continental margins into a highly mobilistic plate tectonics context. Perhaps (as Kerr suggested in his report on the meeting) the hubbub about geologic terranes mostly has to do with terminology.

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