The Ring of Fire

Backarc Basins. Tectonics and Magmatism. BRIAN TAYLOR, Ed. Plenum, New York, 1995. xxvi, 524 pp., illus., + plates. $95.

Nowhere on our planet is the nature of Earth's real estate in such jeopardy as along the "ring of fire" that defines the margin of the Pacific Ocean. In geologic terms, the ring of fire is characterized by two essential morphotectonic elements—deep linear trenches and chains of active volcanoes. These features are manifestations of a fundamental planetary process, the convective stirring of hot material at depth; the trenches mark sites where cold slabs, making up Earth's outer shell, converge and one slab sinks beneath another, sliding back into the underlying hot material of Earth's lower mantle. The forces generated by the interactions at, and along, this zone of tectonic suturing produce destructive earthquakes. In addition, as the cold slab sinks into the hot mantle, it is heated and reacts in a variety of ways with the overlying hot mantle wedge to create molten material that buoyantly rises to create the volcanic arcs of the Pacific's fiery ring. Moreover, the temporal and spatial interplay of magmatism and tectonism along this dynamic interface often results in splitting of the volcanic arcs to form rift zones that, through continued extension, subside and lead to the creation of backarc basins. An inspection of the margins of the Pacific reveals an intricate assemblage of volcanic arcs and backarc basins that define a west-facing crescent from the Bering Sea southward through the Western Pacific. An inventory of areal dimensions, terrain architecture, and geologic history of the arc-backarc basin complexes exhibits considerable variation that appears to be age-dependent, suggesting an evolutionary progression. By careful documentation of the geological (distribution, age, and composition of rock bodies) and geophysical (velocity structure, distribution of mass, seismicity, kinematic history) properties of arc-backarc complexes, the evolutionary path (or paths) that these features follow can be resolved and a fundamental aspect of our dynamic planet understood.

Backarc Basins is a compilation of 14 papers, each of which summarizes salient geological and geophysical characteristics of a particular backarc basin. As an ensemble it samples backarc basins in different stages of development ranging from the initial rifting phase through mature spreading. No other such compilation exists, and the timing of this one is excellent because in the last decade widespread utilization of swath bathymetry and sidescan imagery, multichannel seismics, manned submersibles and remotely operated vehicles, and deep ocean drilling in the backarc basins of the Pacific has created a wealth of information that has revolutionized our understanding of the dynamic processes occurring in these regions. The book is loaded with new data and observations that collectively provide important new insights into the subject.

The backarc basins of the Pacific are natural laboratories where the interplay of magmatic and tectonic processes can be deciphered. Backarc basin processes are particularly significant because they are thought to have been instrumental in the growth and development of this planet's continents through geologic time, as well as the creation of ore deposits of economic importance. *Backarc Basins* should thus be of interest to Earth scientists with a diverse range of interest including marine geology and geophysics, global tectonics, Precambrian geology, and mineral resource prediction. Students of seafloor tectonics will be somewhat disappointed because the format of the volume does not permit the presentation of high-resolution seafloor imaging data at a scale large enough to retain the high-fidelity record of backarc basin tectonism. But this is a minor weakness when balanced against the strengths of this fine compilation.

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Vignettes: Moments of Discovery

He can't recall when he learned the names of the plants in his mother's garden, but he remembers how the exactitude of nomenclature lulled him into comfort. Early on, he knew himself to be one of those who are morally unhoused and in need of specific notation, plants, animals, the starry constellations. Soon, besides his mother's domesticated flowers, he mastered the plantlife of the fields and woods. He had all of it quickly by heart, common names as well as Latin. Each time he was able to match a specimen with the illustration in *Spotton's Botanical Note Book* he experienced a spasm of strength. The green world with its varying forms brought out an exotic tolerance in him and kept him calm. The discovery at the age of twelve or thirteen that the whole of the natural world had been classified, that someone other than himself had guessed at the need for this ordering, struck him like a bolt of happiness.

—From *The Stone Diaries*, a novel by Carol Shields (Penguin Books)

When I was in eighth grade I had a great teacher who had us study the blood system by looking at the tail of a goldfish under the microscope, wrapped in wet Kleenex or something so it wouldn't die. And as we looked through the tail, which was pretty translucent, you could see the blood vessels and see the blood cells moving through the blood vessels and the valves of the veins opening and closing as the fish's heart beat—everything is kind of golden and glittering under the microscope. It was so vivid and so clear just how it was working and it was so extraordinary how this suddenly—literally—jumped into focus. It was a breathtaking moment of being overtaken, and I still feel that about my own organism, when I find something new about it, and it's an extraordinary thrill, and it's holy, the way these things work.

—*Adrianne Bakke*, as quoted by Mary Morse in *Women Changing Science: Voices from a Field in Transition* (Plenum Insight)

Reprints of Books Previously Reviewed

The Gene Wars. Science, Politics, and the Human Genome. Robert Cook-Deegan. Norton, New York, 1996. Paper, $14.95. ISBN 0-393-31399-9. *Reviewed* **265**, 685 (1994).

Outcasts from Evolution. Scientific Attitudes of Racial Inferiority, 1859–1900. John S. Haller, Jr. Southern Illinois University Press, Carbondale, 1995. Paper, $15.95. ISBN 0-8093-1982-9. *Reviewed* **175**, 506 (1972).

Scientific Knowledge and Its Social Problems. Jerome R. Ravetz. Transaction, New Brunswick, NJ, 1996. Paper, $25.95. ISBN 1-56000-851-2. *Reviewed* **176**, 641 (1972).

A Social History of Truth. Civility and Science in Seventeenth-Century England. Steven Shapin. University of Chicago Press, Chicago, 1996. Paper, $16.95 or £13.50. ISBN 0-226-75019-1. *Reviewed* **269**, 707 (1995).