NOTE

A NOTE ON THE TERRANE CONCEPT, BASED ON AN INTRODUCTION TO THE TERRANE '97 CONFERENCE, CHRISTCHURCH, NEW ZEALAND, FEBRUARY, 1997

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A widely accepted definition of a tectonostratigraphic terrane is that of Howell, Jones, and Schermer (1985): a fault-bounded package of rocks of regional extent characterized by a geologic history that differs from that of neighboring terranes.

At the University of Canterbury, Christchurch, New Zealand, in February, 1949, H. W. Wellman addressed the Pacific Science Association and demonstrated a case for 300 miles of transcurrent displacement on the Alpine Fault. Wellman did not publish this till 1955. A report of the meeting by W. N. Benson appeared in 1950, but incorrectly referred to a displacement of 200 miles. The 300 miles or 480 km displacement was convincingly based by Wellman on the offset of what is now called the Dun Mountain Ophiolite Belt and of the massive succession of Permian and Triassic strata that overlie the ophiolite to the west, and of low grade metamorphic rocks lying to the east. Kennedy (1946) had postulated 65 miles lateral offset on the Great Glen Fault in Scotland, but Alpine Fault displacement greatly exceeds that, and was by far the greatest strike-slip movement then documented in the Earth's crust. Progressive intermittent displacement on the Alpine Fault continues today. Wellman's presentation profoundly influenced at least some members of his audience by preparing them for plate tectonic concepts that emerged in the 1960s. Furthermore, at various positions along its length, the Alpine Fault has brought rocks of utterly different parentage into juxtaposition, and Wellman's work can now be recognized as an early and vivid demonstration of one of the ways in which terrane boundaries, as now understood, can develop.

The word terrane has, of course, a very long history of use in non-specific contexts in geological literature. By the 1920s and 1930s terms such as Belt terrane in Montana and Shuswap Terrane in British Columbia were employed, and by the 1960s there were frequent references to such as the Franciscan, Sanbagawa, and Taconic Terranes. In a 1964 paper, W. P. Irwin used the term terrane for belts of rock of contrasting facies in northwest California and adjacent Oregon, but without definition. Definition came in his 1972 USGS Professional Paper "Terranes of the western Paleozoic and Triassic belt in the southern Klamath Mountains, California": "The term 'terrane' as used herein refers to an association of geologic features, such as stratigraphic formations, intrusive rocks, mineral deposits, and tectonic history, some or all of which lend a distinguishing character to a particular tract of rocks and which differ from those of an adjacent terrane." By now the term was becoming more widely used in senses approaching the present usage.

Berg, Jones, and Richter (1972) referred to "subjacent terranes." Monger, Souther, and Gabrielse (1972), in a plate tectonic model, recognized an allochthonous terrane which, however, was "probably not a fragment of Asia, as suggested by Wilson (1968) and Danner (1970)," but is made up of fragments of diverse origin.

In a paper on contrasts between California and New Zealand, Blake, Jones and Landis (1974) divided the Eastern Province of New Zealand into eight "terranes" of contrasting facies and history in the sense of Irwin (1972), and they published the first embryonic terrane map of New Zealand. At least some of the terranes were shown to be fault-bounded. This New Zealand-based contribution was not matched by a map showing Californian terranes. The concept in New Zealand was further developed with what were called "litho-tectonic terranes" (Coombs et al., 1976) in which we speculated on plate tectonic models involving the possibility of thousands of kilometres of relative movement during accretion.

Definitive steps in the terrane concept came with the increasing recognition that the North American Cordillera is a collage of distinct accreted terranes, and with the helpful introduction of the term "suspect terrane" by Coney (1978) and Coney, Jones, and Monger (1980). Their use of the word "collage" followed Helwig's (1974) use of it for an assemblage of mappable units, generated, assembled, and rearranged by tectonic movements. The term "suspect terrane" demands no immediate answer to the question of how much relative displacement might be involved between adjacent terranes. In New Zealand, a revised provisional terrane map was published by Bishop, Bradshaw and Landis (1985). The relationship of some of these terranes to terranes in Antarctica, Australia, and elsewhere, has been discussed by workers such as Bradshaw, Weaver, and Laird (1985) and Cooper and Tulloch (1992), and is an on-going subject for research.

The terrane concept is an inevitable consequence of plate tectonics. It liberates us from any perceived need to find a near-by source for sedimentary piles that may have different provenance from adjacent rocks against which they are in fault contact. While not neglecting the possibility of such a near-by source, we must always suspect the possibility, or even probability in some cases, of gross displacements such as are demonstrated today by the Alpine Fault and by the rafting of oceanic crust by sea-floor spreading. Suspect terranes may have originated at trivial distances from each other or distances of thousands of kilometres. A vital lesson of plate tectonics is that there is no validity to any assumption that the simplest and therefore most acceptable interpretation demands a proximal rather than a distant origin. Some workers still seem reluctant to accept that lesson, although the concept of suspect terranes has now been applied in most continental areas of the Earth's crust.

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