dominated deltaic system with associated barrier strand plain facies; shallower prospective areas range in depth from 7,000 to 12,000 ft (2,100 to 3,650 m). The Frontier has net pay of 10 to 90 ft (3 to 27 m) and post-stimulation gas flows up to 2,500 MCFGD. Characteristics of the Travis Peak have extrapolation potential to Tuscarora-Medina-"Clinton" sandstones of the Appalachian basin; deltaic facies of the Frontier may correspond to parts of the Davis Sandstone (Fort Worth basin), Olmos Formation (Maverick basin), and the Fox Hills Sandstone (eastern Greater Green River basin). Cozzette and Corcoran Sandstones (Piceance Creek basin) are predominantly barrier strand plain deposits; they range in depth from 2,500 to 8,000 ft (760 to 2,400 m), with net pay of 10 to 70 ft (3 to 21 m) each and post-stimulation gas flows average 1,250 MCFGD. The upper Almond Formation (eastern Greater Green River basin) may contain more shallow marine and offshore bar than barrier strand plain facies. It occurs at depths of 6,000 to 15,000 ft (1,800 to 4,600 m), with net pay of 14 to 18 ft (4 to 5.5 m); and post-stimulation gas flows up to 1,700 MCFGD. The characteristics of the Cozzette, Corcoran, and upper Almond may be extrapolated to other marginal marine units in the Mesaverde Group and parts of the Dakota Sandstone in several Rocky Mountain basins. Shelf deposits include the Mancos "B" interval of the Mancos Shale (Piceance Creek and Uinta basins) at depths of 3,500 to 5,000 ft (1,000 to 1,500 m) in areas of recent drilling. Mancos "B" net pay ranges from 38 to 120 ft (11.5 to 36.5 m), and post-stimulation gas flows range up to 350 to 1,200 MCFGD. Extrapolation potential exists in the Anadarko basin and Northern Great Plains area.

These five stratigraphic units have potential for increased commercialization. By understanding the initial properties derived from the depositional setting of a tight gas sand, the explorationist can better extrapolate successful exploration, stimulation, and production techniques between reservoirs in similar depositional settings.

FISCHER, P. J., and G. W. SIMILA, California State Univ., Northridge, CA, and Mesa[2], Inc., Northridge, CA

North Channel Slope Fault, Santa Barbara Basin, California: A Reevaluation

Recently a "major fault zone," the "North Channel Slope fault" was mapped along the northern margin of the Santa Barbara basin by U.S. Geological Survey personnel. The fault consists of a steep topographic escarpment (the north channel slope) and two well-documented faults to the east and west. By connecting the Pitas Point fault, the escarpment, and the F-1 (or Point Conception) fault to the west, a major zone over 100 km (62 mi) in length was postulated. Unfortunately, the connection and the continuous zone are nonexistent.

We have reviewed over 100 deep penetration to high resolution seismic reflection profiles along the escarpment between the Point Conception fault and Coal Oil Point—a distance of 50 km (31 mi). No through-going fault zone is present. Several small, discontinuous faults are mapped, such as the faulting south of the Molino anticlinal fold. But continuous, unbroken, late Neogene and Quaternary reflectors separate such minor high-angle reverse faults. Our interpretation of the deep structure along the margin is in agreement with that of the industry; there is no through-going fault zone.

Rather than connecting with the "steep escarpment," the Pitas Point fault appears to die out south of the Hondo anticlinal structure and cannot be traced beneath the Conception submarine fan to the west. In this area, the fault is expressed as a series of steeply south-dipping, monoclinal flexures.

The F-1 or Point Conception fault dies out immediately west of Gaviota. From this point westward to Point Conception, it is a north-dipping (65° ±), high-angle reverse system that is composed of three en echelon segments with total length of approximately 20 km (12.5 mi) but less than 25 km (15.5 mi). Holocene activity along the eastern and western fault segments is documented by the disruption of the Holocene shelf surface and the distribution of Holocene sediment veneer. The surface over the fault zone is bowed about 3 m (10 ft), and the estimated maximum rate of uplift is 0.3 mm/yr.

The South Santa Ynez fault extends offshore southwestward from Gaviota. The fault is cut by the Point Conception fault near the shelf break. Beyond the edge of the shelf, the South Santa Ynez fault is located south of the Point Conception fault, and represents a north-dipping, high(?)-angle reverse fault. The latest displacements appear to be mid-late(?) Quaternary. The western part of the fault, which underlies the Conception fan, is poorly defined.

A review of the earthquake activity (1932-1981) of the northwestern Santa Barbara Channel region shows several scattered epicenters with magnitude range of 3.0 to 4.5. The fault plane solution for the October 1, 1959 ($M = 4.5$), event indicates right-lateral strike-slip faulting along a north-south direction with northeast-southwest compressive stress. No major historical earthquakes (1800-1932) have occurred in this region, nor is there a trend of epicenters along the north channel slope.

In summary, the existence of a "North Channel Slope fault zone" is not supported by the available evidence.

FOLK, ROBERT L., Univ. Texas, Austin, TX, and HENRY S. CHAFETZ, Univ. Houston, Houston, TX

Diagenetic Calcite Varieties from Travertines of Central Italy

Quaternary travertines in Latium and Tuscany, Italy, were deposited by warm springs containing abundant CO_2 and H_2S. The major rock-formers were bacteria that precipitated calcite to form shrubs, pisolites, mats, foamrock, and clastic silt-size sediment. The calcite cement in these rocks shows extraordinary morphology. The elementary building block is a subspherical clump of bacteria 10 to 40 μm in diameter, which becomes surrounded by a single crystal of calcite shaped like a pecan shell. SEM shows that these crystals are riddled with cavities (voids representing bacteria) and contain internal moats. Later the bacteria-rich crystals became coated with clear, chemically-precipitated inorganic calcite cement; but even these crystals are strange, as they have curving edges and consist of a series of scales parallel to the rhomb faces, like superimposed Gothic arches. Other cement crystals bear a forest of sharp spikes parallel to the C axis like a fakir's bed. The final sparry calcite that fills large pore spaces occurs as large bladed crystals with apparent basal parting planes.

Primarily inorganic sediment includes ray-crystals and pisolites. Ray-crystals can be up to 1 m (39 in.) long and in some places show daily, bacteria-rich growth bands indicating deposition rates of as much as 1 m (39 in.) per year. These formed as travertine dams, on sloping surfaces, and at ancient spring orifices. Crystals can be shaped like cedar-tree needles or club-shaped stromatolites, show undulose extinction, and in the SEM consist of helically twisted calcite ribbons. Inorganic pisolites formed in hot-spring mouths, and are made of smoothly concentric rings of tightly bundled radial rods, like fasces.