interval spans most of the zone of oil generation, as supported by a continuous decrease in H/C atomic ratios of the kerogen and hydrogen index from pyrolysis of the whole rock. The ratio of extractable organic matter (bitumen) to total organic carbon increases with depth, recording the formation and reservoiring of hydrocarbons in the chalk. The extractable organic matter becomes enriched in saturated hydrocarbons at the expense of non-hydrocarbons with increasing depth of burial, while the saturated hydrocarbons themselves become more like crude-oil hydrocarbons and less like immature, bitumen hydrocarbons in the deepest samples. The Austin Chalk appears to have acted as a source rock for at least part of the crude oil reservoired in and produced from the formation.

GRAHAM, STEPHAN A., Stanford Univ., Stanford, CA

Tectonics, Sedimentation, and Petroleum Geology of Transform Margin of Central California

Although wrench tectonics of the San Andreas transform fault system dominate the structure of modern central coastal California, regional sedimentary basin evolution and petroleum geology are best viewed in the context of transform tectonics superposed on an older convergent margin regime. Convergence along the central California margin continued from the Mesozoic until the mid-Tertiary, interrupted briefly in earliest Tertiary time by strike-slip faulting related perhaps to oblique subduction. Convergence finally ceased in the Oligocene with the diachronous propagation of the San Andreas marginal transform system. Apparently, the locus of shear within the transform system migrated shoreward and continentward with time to the present position of the San Andreas fault, progressively involving granitic basement in lateral translations.

Regional tectonics strongly control the character of central California sedimentary basins and distribution of sedimentary facies. The expansive patterns of Cretaceous and earliest Tertiary forearc basin sedimentation, less favorable in reservoir provenance, organic source-rock character, and burial history, were replaced in early Tertiary time by deposition in localized borderland basins related to strike-slip faults. However, it was the full development of the marginal transform system during the Neogene which provided the requisite elements for a productive and still prospective petroleum province: discrete, moderate-sized, structurally controlled sedimentary basins; deposition through rapid subsidence of thick piles of organic-rich marine sediments in silled, anoxic borderland basins; favorable reservoir provenance through deep dissection of granitic uplifts; and extensive, early wrench tectonic structuring of basin fill, often influencing syntectonic patterns of sedimentation.

GRAY, LYNN D., Union Oil Co. of California, Ventura, CA

Geology of Mesozoic Basement Rocks from Well Cores in Santa Maria Basin, Santa Barbara County, California

The Mesozoic rocks underlying the Tertiary cover in the Santa Maria basin, California, consist of an Upper Cretaceous sedimentary sequence overlying dismembered ophiolitic rocks of undetermined age. The ophiolitic rocks are ophicalcites, basalts, greenstones, dike and sill rocks, gabbros, and serpentenized peridotites in a Franciscan assemblage. The Upper Cretaceous rocks are sandstones, mudstones, and shales that were deposited in a submarine fan environment. They are characterized by tectonic disruption in the form of brecciation and chaotic mixing. These basement rocks of the Santa Maria basin were compared to rocks of similar age surrounding the basin in terms of petrography, sedimentary structures, and facies relations. Two major groups of strata were compared: relatively undisturbed sedimentary rocks correlated to the Great Valley sequence and the disrupted Franciscan rocks of the Cambria, Point San Luis, and Pfeiffer Beach slabs. The Santa Maria basin basement rocks are similar to the latter group.

Mesozoic rocks underlying the Santa Maria basin were formed in a converging plate boundary regime on the inner trench-slope. The ophiolitic rocks and the overlying deep-water cherts and pelagic sediments were accreted in fold and thrust segments as the downgoing oceanic plate was subducted. The accreted material formed linear ridges which trapped younger sediments in a trench-slope basin. Sediments from several different source areas accumulated in these localized basins and were tectonically deformed with continuation of subduction in the trench. The rocks resulting from this process are called the Franciscan melange.

The Santa Maria basin formed above these Franciscan rocks following collision of the Farallon-Pacific spreading center with the trench off California in Oligocene time. The subsequent transform regime produced major right-lateral strike-slip fault movements and associated downwarping of the Santa Maria area. Deep-water, middle Miocene sediments were deposited in this newly formed basin in contact with the Mesozoic rocks.

GREENE, JOHN M., Shell Oil Co., Houston, TX, and S. O. SEARS, Shell Development Co., Houston, TX

Detailed Reservoir Geology—Basis for Enhanced Recovery Model, Wasson San Andres Field, West Texas

Core studies in the CO_2 pilot area of Shell's Denver unit in the Wasson San Andres field of west Texas revealed two basic end-member rock types: pelletal packstones, which exhibit high porosity and permeability due to the effective inter-pellet pore fabric; and moldic wackestones, which have lower porosity and significantly lower permeability, due to the disconnected fabric of the moldic pores. The majority of the rock section consists of a mixture of these end-member rock types due to cyclical variations in the degree of organic burrowing, which created the pellet packstones by reworking the original wackestone lithology. The high quality pellet packstones are dominant in rocks with greater than 15% porosity. The geologic model of the pilot area thus consists of numerous correlative high porosity zones composed dominantly of packstones, interbedded with poorer quality moldic wackestones.

An examination of cores from representative wells throughout the Denver unit also documented the occurrence of pelletal packstones, dominantly in rocks with greater than 15% porosity. By using digitized sonic logs from 688 wells in the Denver unit and the LOGPAK program, isopach mapping of packstone thickness in each of the correlative field-wide San Andres subzones was accomplished. Recognition of the detailed zonation of rock types from the pilot area in wells throughout the major part of the Denver unit permitted expansion of the pilot area model to the larger Denver unit model.

GRIBI, EDWARD A., JR., Consultant, King City, CA

Salinas Basin—Subtle Traps All