JOHNSON, JEFFREY A., Univ. California, Los Angeles, CA

Reconstruction of Deformed North Pyrenean Basin

The North Pyrenean basin in southern France was initiated in middle Cretaceous time along the North Pyrenean fault zone. An understanding of the middle Cretaceous is critical because it corresponds in time to opening in the Bay of Biscay, to postulated strike-slip along the North Pyrenean fault, to a controversially dated episode of metamorphism, and to emplacement of lherzolite. A field study of the Albian and Cenomanian fill of the North Pyrenean basin has been undertaken in order to provide constraints on postulated regional relationships during this time.

Two steps are required for the study. The first is to reconstruct the structure of the basin that was deformed during the Late Cretaceous to Oligocene Pyrenean orogeny. The orogeny is here summarized as a north-south shortening that reactivated the North Pyrenean fault zone as a north-vergent reverse fault. Dominantly south-directed thrusting followed, and detachment along incompetent Triassic shale and evaporite layers was important in both phases. The second step is a sedimentologic analysis. The basin fill is dominantly marine, clastic mud, up to 4 km thick. Abrupt lateral thickness and facies variations demonstrate that the basin was bounded by active faults. Excepting the absence of high organic productivity, reconstruction suggests that the North Pyrenean basin is a partial analog in terms of geometry, facies arrangement, and regional setting to Cenozoic marine basins in California, particularly to those in which Monterey Formation lithologies were deposited.

JOHNSON, KENNETH G., Skidmore College, Saratoga Springs, NY

Carbonate to Siliciclastic Transitional Facies in Tectonic Delta Complex—Basal Upper Devonian of East-Central New York State

In an early stage of building of the Devonian Catskill delta complex of New York state, a submarine topographic high developed 100 km offshore. On the landward side of the high, in an intermittently subsiding trough, sediment from an eastern source terrane accumulated as a landward-thickening and coarsening lithosome (Gilboa Formation) of interlensing gray siltstone and shale and very fine-grained sandstone with subordinate coquinite lenses. Locally abundant in the lithosome are ball-and-pillow structures, thin conglomerates, trace fossils, fossil seed ferns, sole markings, shallow cross-bedding, laminations, and ripple marks. The high was a barrier to clastic influx. On its seaward side, a carbonate lithosome (Tully Formation) formed. This formation has been subdivided into facies including: abraded calcarenite, chamoside oolite, skeletal calcilutite, barren shaly calcilutite, mound calcilutite, back-mound calcilutite, and encrinite. The effect of combined intermittent subsidence in the basin-margin trough and variation in rate of terrigenous influx is well expressed in the seaward part of the siliciclastic lithosome. Rapid subsidence and low terrigenous influx finally resulted in a short-lived carbonate transgression across the barrier prior to overwhelming of the shelf by terrigenous influx.

JOHNSON, RONALD C., and THOMAS M. FINN, U.S. Geol., Survey, Denver, CO

Age of Douglas Creek Arch, Colorado and Utah

Isopach mapping and stratigraphic studies in the Douglas Creek arch area, a north-south–trending structure that separates the Uinta basin of Utah from the Piceance Creek basin of Colorado, indicate that the arch was formed largely during the Laramide orogeny (Late Cretaceous, late Campanian through Eocene). Formation was contemporaneous with the formation of the Uinta and Piceance Creek basins, but may have been present as a very broad, low-amplitude structure earlier during the Sevier orogeny. Recent paleogeographic reconstructions by other workers, however, suggest that the Douglas Creek arch was largely pre-Laramide.

The Dakota to Castlegate Sandstone interval, which predates the Larmide orogeny, thickens toward the northwest on the west flank of the arch and toward the northeast on the east flank. This thickening roughly outlines the arch, but is much broader, and more closely parallels the Uncompahgre uplift south of the arch. The thickness of the Castlegate to Cretaceous-Tertiary unconformity interval, which brackets the early stages of the Laramide orogeny, is nearly uniform west of the arch, but thickens abruptly east of the crest of the arch. This interval has been modified by an unknown amount of erosion during the following hiatus. Upper Paleocene rocks above the unconformity lap out toward the arch from both directions, indicating that the arch was rising during the hiatus. The intervals from the Cretaceous-Tertiary unconformity to the lower Eocene Long Point bed and from the Long Point bed to the middle Eocene Mahogany bed thicken away from the arch, indicating that the arch was active during early to middle Eocene. A structure contour map of the top of the Mahogany bed indicates considerable post-Mahogany movement as well. The arch was therefore largely if not totally a Larmide structure.

JONES, R. W., Chevron Oil Field Research Co., La Habra, CA

Origin, Migration, and Accumulation of Petroleum in Thick Cenozoic Delta Systems

The distribution and percentages of oil and gas in Cenozoic delta systems have often been attributed to the variations in the distribution and amount of "oil-prone" and "gas-prone" organic matter in the presumed source rock. This genetic relationship has been greatly exaggerated. Data have become available in the past 10 yr indicating that the distribution and amount of oil versus gas in reservoirs primarily reflects the relative ease of migration of the 2 hydrocarbon phases. For example, pressure (active compaction) seals are the preferred cap for gas in the McKenzie delta, fault conduits were not available hydrocarbon migration until the primary source rock was in the gas stage of thermal maturation in the eastern portion of the ancestral Orinoco delta, mature source rocks in the Mahakam delta yield oil to the reservoirs if they are normally pressured but only gas when they are overpressured, the amount and distribution of oil and gas in the Niger delta are primarily controlled by fault displacement and leakage, and in the Mississippi delta the primary control is overall structural complexity.

Although specific source rock units have been tentatively identified in several of the Cenozoic deltas, it is possible that the more than 10,000 ft of overmature marine shales that underlie all of these delta systems contain the most important driving force for the migration of both oil and gas. Although the TOC's are usually modest, the total amount of methane generated is very large. As the methane moves upward through the section, it sequentially dissolves, moves, and precipitates the liquid hydrocarbons. Faults are very important in the focusing of the migration and the accumulation of the hydrocarbons.

JONES, THOMAS A., Exxon Production Research, Houston, TX

Three-Dimensional Computer Modeling for Exploration and Reservoir Analysis

Anyone who has done exploration or reservoir studies involving large numbers of logs, cores, or seismic data is aware of the great amount of manual labor required to reduce the data, to draw structure and thickness contour maps, and to make lithologic cross sections. While computers are commonly used to draw contour maps, lithologic cross sections and 3-dimensional interpretations are still made by hand. Computer programs have been developed that build and use 3-dimensional models. These programs use data from wells or shotpoints to interpolate the geologic properties in 3 dimensions between control points much as a geologist would construct cross sections (i.e., by correlating between stratigraphic horizons). Modeling may be done at any scale, from large basins to individual reservoirs, and with an appropriate amount of incorporated detail. After the model is constructed, it is available for calculations and displays. Cross sections can be constructed showing the geographic extent of the rock properties. Similarly, facies maps can be drawn to depict geology at specified depths or along geologic time surfaces. Information in the model can also be used to construct contour maps such as net pay thickness or average porosity, and to compute volumes.

JORDAN, CLIFTON F., JR., Mobil Research & Development Corp., Dallas, TX, RICHARD J. WHARTON*, Mobil Oil Indonesia, Jakarta, Indonesia, and RUFUS E. COOK, Basic Earth Science Systems, Dallas, TX

Holocene Carbonate Facies of Pulau Seribu Patch-Reef Complex, West Java Sea