genetic analogies, and by just not discerning what was available for viewing in the field or laboratory. Capitan remains a model "in flux" awaiting more critical field and laboratory research.

SCLATER, JOHN G., University of Texas, Austin, TX

Extensional Models for Formation of Sedimentary Basins and Continental Shelves

Two kilometers of sediment cover more than 70% of the continents. The major accumulations occur in sedimentary basins and at continental shelves. The areas of maximum subsidence are generally associated with thin crust and evidence of extension. Of the concepts advanced to explain this subsidence, uniform extension has proved the most useful.

Models based on uniform extension account for the gross features of the basins and shelves, and provide a quantitative method for examining the history of subsidence. Modifications, however, are needed to explain the detailed subsidence of most areas and to account for regions with early uplift. Problems associated with the sum of the heave on the faults underestimating the amount of extension appear resolved.

The problems and modifications lead to limitations in the use of the models. The advantage, however, that they require a quantitative evaluation of all the data more than offsets these limitations. Because of this requirement for quantitative evaluation, the models have great value as tools in the design of data-acquisition programs.

SCOTT, ALAN J., RPI International, Inc., Boulder, CO

A Spectrum of Late Paleozoic and Cretaceous Shelf Bars, Western United States

Shelf-bar sandstones of the Cretaceous Western interior seaway of North America form excellent stratigraphic traps for hydrocarbons. Modern shelf sands occur in a variety of settings and are affected by such processes as storms and tidal, longshore, and shelf currents. Case studies of several Cretaceous and late Paleozoic sandstones document a spectrum of ancient shelf-bar types analogous with modern shelf systems.

Several shelf bars deposited in nearshore environments (8-10 mi offshore) were associated with deltaic axes. Sands were reworked from these axes by currents moving along the shoreline that were diverted by a headland. Such shelf-plume sandstones were subsequently reworked by storms and other shelf processes. The relative effects of storm and shelf or coastal currents greatly influenced the geometry and characteristics of the nearshore shelf bars, of which several variations can be documented.

Tidal currents are an important factor in forming and modifying modern shelf bars in the North Sea. Examination of primary structures and directional features suggests tidal currents were relatively unimportant in nearshore shelf bars of the Cretaceous Interior seaway. Examples of Pennsylvanian shelf-bar sandstones from the Sacramento Mountains of New Mexico have features characteristic of both storm and tidal processes.

Detailed examinations of primary sedimentary structures and facies relationships are useful in recognizing the various shelf-bar types and predicting the occurrence and distribution of similar potential reservoirs.

SCOTT, ALAN J., RPI International, Inc., Boulder, CO

Depositional Systems and Cycles, Eocene Yegua Formation, Texas, Gulf Coastal Plain

Tertiary Gulf Coast stratigraphy is characterized by a series of large-scale progradational wedges. Fluvial-deltaic and deep-water sandstones in several progradational units have proven to be prolific hydrocarbon-bearing reservoirs. The Eocene Yegua Formation is considered a relatively minor wedge compared to the Wilcox, Vicksburg, and Frio progradations. Prior to the late 1970s, Yegua exploration, and thus stratigraphic control, were confined to areas overlying the relatively stable submerged Wilcox deltaic platform.

Basinward, the Yegua thickens significantly beyond the margin of the Wilcox platform. In the few wells penetrating this thickened Yegua section, thick sandstones were unexpectedly encountered several miles beyond presumed Yegua shorelines. The discovery of Black Owl and Toro Grande fields in the early 1980s triggered an exploration play in the expanded Yegua. Several depositional models were proposed to explain the occurrence of sandstones in this downdip setting. Deep water, shelf, and deltaic origins all had their proponents.

The Yegua has numerous thin, laterally persistent, high-resistivity shales. These shales, inferred to be deposited during transgressive (nonprogradational) episodes, have been used to subdivide the Yegua Formation into 12 genetic units. Correlation of these marker beds in more than 4,000 wells has resulted in a series of detailed regional maps delineating and documenting Yegua depositional systems and cycles.

The Yegua in the central Texas coastal plain is characterized by a series of narrow (1-3 mi wide) dip-oriented depositional axes. These axes represent meanderbelt and distributary channel deposits associated with fluvial and deltaic systems. The scale of these features is comparable to modern Texas coastal plain systems. The distribution and direction of the narrow axes are strongly influenced by syndepositional growth faults. Reworking of sands by shoreline processes are only a minor factor influencing reservoir distribution in the Yegua.

Regional mapping also documents shifts in depositional axes and depocenters of the various Yegua genetic units. Several minor Yegua depositional cycles are the result of these shifts rather than eustatic sea level fluctuations. However, a eustatically controlled cycle within the Yegua has been documented, and provides a mechanism for deposition of sand in the downdip Yegua trend. Several other sands in this trend are associated with dip-oriented fluvial and deltaic axes deposited during progradational episodes. As these axes extended beyond the margin of the subjacent Wilcox platform, they reactivated, or initiated, a series of growth faults. Sand deposition was thickened and confined to localized depocenters along these faults.

THOMASSON, M. RAY, Pendleton Exploration, Denver, CO

Seismic Prediction of Porosity and Hydrocarbon Traps in Carbonate Rocks

Seismic stratigraphy has been used in many areas to identify stratigraphic carbonate traps such as shelf margins, pinnacle reefs, mounds, and updip porosity pinch-outs. Many large oil fields are the result of oil entrapment in these types of stratigraphic traps. Examples include fields from the Gulf Coast, Permian basin, Mid-Continent, and Rocky Mountain provinces in the United States, as well as fields in the Middle East, Canada, North Sea, and the Far East.

Where the trap shows geomorphological relief, evidence such as draping, pull-ups, dim spots, data dispersion, and other criteria can be used. Stratigraphic carbonate traps can be localized with some precision using these criteria. However, the specific definition and measurement of porosity in carbonate rocks are much more difficult. With very careful integration of geologic (rock data from cores and petrophysical data from logs) and geophysical (high resolution seismic) data, it is possible to estimate both the thickness and, in a qualitative way, the amount of porosity in a potential carbonate reservoir.

During the Carboniferous in the Mid-Continent, a sequence of depositional and diagenetic events created irregular pods of porosity in otherwise tight limestones. The areal extent, thickness, and quality of this porosity are the primary factors that determine the location, geometry, and productivity of major oil fields in the area. A twenty-million-barrel oil field has been studied in detail, and the initial production rates and overall production richness correspond closely to measurable seismic phenomena. A seismic line shot through the producing interval at a depth of 4,000 ft, using 30-fold, broad band (20-120 hertz) data has allowed the recovery of frequencies over 100 hertz. These data confirm (1) the presence of porosity and (2) field limits that correspond to the field limits known from subsurface information.

The Geoquest System work station was used to model (1) the key porous interval as known from core and petrophysical data in the analog field and (2) evaluate similar phenomena in the surrounding play area and measure both porosity thickness and quality in prospective stratigraphic traps. Two specific trap types occur regionally. The first type evidences porosity that developed locally and has an acoustically recognizable event over it (and between it and an overlying shale). The second type shows evidence of local porosity extending vertically to the shale seal. In both types, the lateral limits can be mapped seismically. The trap types have very different characteristics; both trap types and variations of them can be modeled successfully.

The trap types discussed are very subtle and have historically been