sia, C. JORDAN, Mobil Research and Development Corp., Dallas, TX, and A. J. JENIK, Mobil Oil Indonesia, Jakarta, Indonesia

Carbonate Petrology of Arun Limestone, Arun Field, Sumatra, Indonesia

The Arun gas and gas distillate field (estimated 13.7 tcf hydrocarbon gas in place) is a large Miocene coral-algal reef complex located on an intrabasin high in the North Sumatra basin. It was discovered in 1971 by Pertamina/Mobil Oil Indonesia following definition of a reflection seismic anomaly. The field is a large, asymmetric stratigraphic trap 18.5 km (11 mi) long and 5 km (3 mi) wide. The Arun Limestone which forms the reservoir is overlain, underlain, and possibly surrounded by shale. The limestone ranges in thickness from zero west of the field to about 1,200 ft (365 m) in well A-10. Closure on the Arun Limestone is at least 1,200 ft (365 m).

The reservoir rock is made up of several carbonate rock types, including coral-algal boundstones, foraminiferal packstones and wackestones, mixed-skeletal wackestones and packstones, and dolomite. Interstitial fill of the reef consists of lime and reef detritus (i.e., skeletal wackestones and packstones); grainstone fabrics are notably absent in the Arun reef and related facies.

Diagenesis has had a strong effect on the original sediments; (1) the lower part of the reservoir is completely dolomitized; (2) patches of limestone throughout the Arun are recrystalized to sparry calcite; and (3) much, if not most, of the reservoir is strongly micritized. The most pronounced effect of diagenesis has been the formation of secondary moldic and vuggy porosity formed by the dissolution of aragonite fossils (mainly branching corals, mollusks, and foraminifera). Had there been no diagenesis of the original limestone, it is doubtful that a hydrocarbon reservoir would be present on the Arun structure.

NELSON, KATHERINE, Univ. Texas, Austin, TX

Estuarine and Fluvial Systems, Lower Mesaverde Group (Campanian), Northwestern Colorado

Stacked shoreline sandstones near the base of the Mesaverde Group are well exposed along the southern flank of Rangely dome, northwestern Colorado. Overlying these marine deposits is a thick sequence of carbonaceous siltstones that encase elongate lenticular sandstones. This sequence records the evolution from estuarine to fluvial channels formed along the western margin of the Cretaceous Western Interior seaway. Sections 180 to 250 m (590 to 820 ft) long, were measured along a trend perpendicular to paleoshoreline. Several individual sandstones were studied in detail to develop depositional models. Data from over 300 well logs provided information regarding regional distribution and stratigraphic relationships of the systems. Two major stratigraphic successions were recognized.

Thin (0.5 to 2 m, 20 in. to 6.6 ft) bioturbated and root-mottled fine sandstones, interbedded with pervasive siltstones occur immediately over the marine shoreline deposits in both sequences. The sandstones are interpreted as storm washover deposits. At Gillam Draw in the eastern portion of the outcrop study area, the washover sandstones are overlain by 50 to 60 m (165 to 195 ft) of bioturbated shales and siltstones. Ripple-stratified, upward-fining, fine to very fine sandstone lenses occur in this interval. These lenses are 4 to 8 m (13 to 26 ft) thick, have erosional bases, and have well-developed lateral-accretion bounding surfaces. *Ophiomorpha* and other trace fossils suggest an estuarine influence. The sandstone lenses are point bar deposits formed along meandering tidal creeks. Siltstones, coals, and 8 to 12 m (26 to 39 ft) thick lenticular sandstones overlie the tidally influenced interval. The sandstone lenses change significantly in geometry, bounding surface relationships, and textural trends within this succession.

Stratigraphically lower sandstones form broad (100 to 200 m, 330 to 660 ft wide) belts. Individual sandstone bodies within the lenses have erosional bases and prominent lateral-accretion surfaces. Trough cross-bedding near the base is overlain by ripple stratification. These broad, lenticular sandstones represent fluvial meander-belt deposits.

Sandstone lenses become narrower and lack accretionary surfaces higher in the section. These younger sandstones are multistoried, rather than multilateral, channel deposits and are flanked by extensive crevasse splay facies. They are interpreted as confined anastomosing fluvial channels. West of Gillam Draw, the anastomosing fluvial system directly overlies shoreface and storm washover deposits. The multistoried lenticular sandstones are thicker (20 to 30 m, 66 to 100 ft).

Sedimentation kept pace with subsidence in the eastern, basinward sections. Lower reaches of streams were tidally influenced even though the area was not inundated by marine waters. The western succession represents aggraded fluvial systems formed inland from the coast. Both sequences are characteristic of areas of rapid subsidence.

NIELSON, R. LARELL, Texas Christian Univ., Fort Worth, TX

Origin of Chert in Permian System in Southwestern Utah and Northwestern Arizona

Within the Permian System in southwestern Utah and northwestern Arizona, the Brady Canyon Member of the Toroweap Formation and the Fossil Mountain and Harrisburg Members of the Kaibab Formation contain five different forms of chert. These chert forms provide information about the origin and emplacement of chert in the Permian System. The forms present are: rounded chert nodules, ribbon chert, silicified burrows, disseminated chert, and massive chert that grades into limestone. Sources of chert are attributed to upwelling of deep bottom waters, silica-derived from freshwater mixing with saline water in deltaic complexes, and precipitation of silica through biological processes. Examination of fossiliferous rounded chert nodules, silicified burrows, ribbon chert, disseminated chert, and stringers of chert, indicate that deposition was the result of secondary solution moving through areas with greater porosity. Disseminated chert, found in the Fossil Mountain Member, was deposited in the areas where the porosity was greatest. Massive chert in the Harrisburg Member formed at the water table where dissolution of the limestone occurred. This chert layer was then exposed to erosion. Chert emplacement occurred following the partial dolomitization of the limestone early in the diagenetic history. Some chert appears to have been deposited as secondary cement in the carbonate rock following cementation and dolomitization. Chert horizons in the upper part of the Kaibab Formation suggest that chert may have developed much later during an erosional cycle. This is supported by colloform structures and gradation from a massive chert down to limestone.

NIQUETTE, THOMAS, and MARC NORRIS, Northwestern Resources Co., Huntsville, TX

Evaluation of a Structurally Disturbed Portion of Wilcox Lignite Trend