MEETINGS

DINNER MEETING—APRIL 13, 1987

JEFFREY J. DRAVIS—Biographical Sketch

Jeffrey J. Dravis received a Bachelor of Science degree in Geology from St. Mary's University in San Antonio in 1971. In 1977, he was awarded a Master of Science Degree in Marine Geology from the University of Miami's Rosenstiel School of Marine and Atmospheric Sciences. Jeff's thesis research delineated Holocene sedimentary facies and their early diagenesis across a high-energy Bahamian platform, Eleuthera Bank. In 1976, Jeff entered Rice University to pursue a doctoral degree in geology. His dissertation documented the regional facies and diagenetic relationships of the Austin Chalk in south Texas and northern Mexico, concentrating on its porosity evolution. Dr. Dravis began his professional career in 1978 with Exxon Production Research Company. During his eight years with this organization, he was responsible for conducting applied research on the prediction of carbonate facies and porosity evolution in the subsurface. He also trained Exxon geologists and geophysicists in both basic and advanced principles of carbonate sedimentology applied to hydrocarbon exploration and production, and provided technical guidance in carbonates to affiliate offices around the world.

Dr. Dravis currently consults in the United States and Canada as a carbonate sedimentologist. In addition, he is associated with PetroQuest International Inc., a new international consulting firm founded last year by Edward Purdy. Dr. Dravis is also presently teaching a course in carbonate sedimentology at Rice University, where he is an adjunct associate professor of geology and geophysics.

REGIONAL FACIES AND POROSITY RELATIONSHIPS IN JURASSIC HAYNESVILLE LIMESTONES OF EAST TEXAS

The Upper Jurassic (Kimmeridgian) Haynesville Limestone is a major gas-producing sequence in East Texas. Notable fields include Delrose, Gladewater, Gilmer and Overton. These fields are excellent case histories for two reasons. First, they demonstrate a close relationship between preserved porosity and depositional facies. Secondly, and more importantly, the reservoir porosity associated with these fields is a result of deeper-burial diagenetic processes and not near-surface diagenesis. Burial diagenesis has occluded much of the Haynesville's primary macroporosity while at the same time promoting development of secondary microporosity which now constitutes the main reservoir pore type.

During Upper Jurassic time, a series of oolitic shoal complexes developed along the eastern flank of the East Texas Salt Basin on the crest of a roughly north-south structural element, the East Texas Arch. Haynesville deposition occurred on a ramp, with water depths gradually increasing to the east into a relatively deep basinal environ-
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ment. West of the shoal complexes, waters deepened into the East Texas Basin but to the northwest, Haynesville carbonate facies grade laterally into time-equivalent, nearshore siliciclastic facies.

By applying modern analogues and using comparative sedimentology, the shoal complexes can be subdivided into either high-energy active oolitic grainstones or stabilized low mud to very muddy oolitic packstones. Active grainstones formed in response to daily strong tidal and/or wave agitation and commonly exhibit preserved cross stratification. In contrast, oolitic deposits permanently stabilized by organic activity tend to be muddier, bioturbated and generally lacking of cross stratification. Stabilized oolitic sands occur either landward or seaward of, or between, active grainstone shoals depending on physiographic setting and seafloor topography. Downramp, east from the shoal complexes, darker oncolitic and peloidal packstones to wackestones were deposited with a diverse open-marine fauna. West and northwest of the shoal complexes, however, water circulation was sufficiently restricted by the oolitic shoals, permitting only dark peloidal packstones to wackestones with a lower faunal diversity to be deposited.

Generation of Haynesville reservoir microporosity is related to burial diagenetic processes influenced by hydrocarbon maturation and migration. Haynesville microporosity formed in response to deep-burial processes unrelated to any near-surface, fresh-water diagenetic influence. Most microporosity formation is concomitant with, or postdates, the majority of pressure solution phenomena in the oolitic grainstones. As a result, Haynesville porosity and diagenetic relationships are consistent over the entire length of the trend on the East Texas Arch, a distance of over 100 kilometers. These relationships hold true for the oolitic grainstone shoals, and for the thicker down-ramp tempestites which are encased in micritic packstones and wackestones.

Some of the observations which confirm deep-burial generation of this microporosity include: 1) a conformable vertical facies sequence throughout the Haynesville and lack of subaerial exposures features; 2) absence of near-surface fresh-water porosity types and cement fabrics; 3) pervasive pressure solution in the microporous reservoir facies which produced extensive grain interpenetration, and the corresponding lack of significant precompaction cementation; 4) microporosity development restricted only to grainstones; and 5) interparticle and intraparticle cements whose geochemical signatures negate a fresh water origin but are consistent with their precipitation under deep-burial conditions. Many of these cements are also epifluorescent and some are admixed with hydrocarbons or actually oil-stained. In a few areas where ooids are completely encased by bitumen, microporosity is not developed, providing additional evidence for the relatively late timing of microporosity generation.

Well-documented case histories, such as the Haynesville, are useful because they provide explorationists with new options when prospecting for limestone sequences previously thought too deeply buried to be porous. Refining the exact timing of deep secondary porosity development in such sequences can only serve to enhance our success in predicting subsurface porosity trends.