dels to gain a better understanding of displacement processes.

WARME, J. E., Colorado School Mines, Golden, CO, N. SCHNEIDERMANN, Gulf Research and Development Co., Houston, TX, and S. D. SCHAFERSMAN, Reservoirs, Inc., Houston, TX

Contemporaneous Reconstruction and Cementation of Living Lagoonal Patch Reef, Enewetak Atoll, Marshall Islands

A patch reef on the sheltered side of the lagoon at Enewetak, a Pacific oceanic atoll, was sampled from the living coral-algae veneer near the water surface to the lagoon floor at -7 m water depth. The reef was exposed by selective blasting, and samples were studied by slabbed sections, thin sections, and the scanning electron microscope.

The reef is repeatedly and pervasively cemented by crystal aggregates of aragonite and magnesium calcite and by microcrystalline magnesium calcite, and does not show marked preferential control by host mineralogy. Cements (1) fill skeletal cavities, (2) fill borings in both skeletal elements and other early cement, and (3) bind, as mud-sized magnesium calcite, fine-grained bioclastic debris that accumulates in voids of all sizes and origins. The distribution of both cements and cavities is extremely variable, as is cavity size and geometry. Drilled plugs, from the reef core, had porosities of 12.7 to 36.5% and permeabilities of 135 to 32,843 md.

Externally, the reef appears to be a porous boundstone; internally, it changes to wackestone and packstone. Contemporaneous and repeated penetration by micro- and macro-borers continually obliterate original boundstone framework, replacing it with cemented cavities and debris; conversion to wackestone and packstone continues as long as the reef is exposed to seawater.

The diagenetic process results in transformation of the reef from delicate framework to compact limestone, from porous elements to dense rock, and from a large proportion of skeletal aragonite to apparently inorganic aragonite and crystalline and microcrystalline magnesium calcite. It also accounts for the difficulty of identifying the framework core of some fossil reefs.

Despite the effects of pervasive boring, submarine cements and cemented debris maintain and increase the strength of the reef, which has withstood storms, typhoons, and nuclear blasts.

WARNER, M. A., Chevron U.S.A., Inc., Denver, CO

Source and Time of Generation of Hydrocarbons in Fossil Basin, Western Wyoming Thrust Belt

Oil trapped in Triassic-Jurassic reservoir rocks in fields along the Ryckman Creek-Pineview structural trend on the Absaroka thrust plate was generated in source rocks in the footwall Cretaceous sequence which was overridden by the thrust plate. This conclusion is supported by data from a variety of analytic techniques used to make oil-to-oil and oil-to-source rock correlations. The source of hydrocarbons in Paleozoic reservoirs in the Whitney Canyon-Carter Creek trend on the Absaroka plate is more difficult to identify with certainty. The accumulations in the Paleozoic rocks are dominantly gas with some condensate, and a significant amount of H_2S is present in contrast to the low-sulfur "sweet" oil and gas in the Ryckman Creek-Pineview trend. The identical sulfur content and chromatographic character of condensate from the Paleozoic and the Triassic-Jurassic reservoirs suggest that both are from the same source.

Reconstruction of the maturation history and measurement of present levels of thermal maturation of source rocks in different structural settings in the Fossil basin demonstrate that peak generation and migration of hydrocarbons from Paleozoic source rocks predated the Absaroka fault which was formed about 75 m.y.B.P. Cretaceous source rocks beneath the Absaroka plate were immature when overridden by the fault and have reached a high level of maturity since that time. Most of the hydrocarbons were generated and expelled from source rocks in the footwall sequence during the last $60\pm$ m.y., after the hanging-wall structural traps involving both Mesozoic and Paleozoic reservoirs were formed.

WARSHAUER, S. M., R. SMOSNA, and J. J. RENTON, West Virginia Univ., Morgantown, WV

Depositional Environments of Lacustrine Limestones and Their Relation to Major Coal Seams, Upper Pennsylvanian of West Virginia

In the Monongahela Group, lacustrine limestones are intimately associated with important coal deposits as evidenced by (1) their common biogenic origin within embayments between clastic deltaic lobes, (2) the interbedding of thick limestones and minable coal seams, and (3) their paleogeographic proximity. A preliminary study of the lower Monongahela Group in the northern coal basin of West Virginia shows that the seemingly monotonous limestones are actually variable in terms of both paleontology and petrology. Freshwater fossils in these beds include micro- and macro-invertebrates (darwinulid and cypridid ostradoces, mollusks, and abundant *Spirorbis*), vertebrates (fragments of amphibians and fish), and megaplants, and calcareous algae. These rocks are classified as finely laminated micrite, pelmicrite, and intramicrite. Sedimentary structures such as mud cracks, desiccation chips, caliche, and bird's-eye all indicate frequent drying. Water-level fluctuations that commonly affected the lakes, as interpreted from limestones, also affected nearby coal swamps in terms of plant types, water chemistry, and degradation rates. These then determined coal lithotype and ash content. During the periods of subaerial exposure, rare gypsum crystals were precipitated interstitially in the carbonate mud, and the concentration of minerals like gypsum may be one source of sulfur for pyrite in adjacent high-sulfur coals. Hence, the understanding of depositional environments in the lacustrine limestones provides further insights into details of coal formation.

WARZESKI, E. ROBERT, State Univ. New York at Binghamton, Binghamton, NY