ronments. Trace preservation is poor, but is typified by low diversity and high abundance. Uppermost Pennsylvanian turbidite deposits on Bovine Mountain contain *Helminthoida* and *Chondrites;* basal Wolfcampian rocks of the Grassy Mountains bear *Helminthoida, Protopaleodictyon,* and *Lophoctenium.*

Upper Wolfcampian fetid, soft-sediment-folded, arenaceous siltstones locally yield indigenous fauna that suggests an off-shelf origin. In the Hogup and Grassy Mountains, *Helminthoida* is preserved, but in general the trace-fossil record is scanty in this interval.

In Leonardian time, the Oquirrh basin filled to shelf depth, and a mixture of vertical and horizontal bioturbation again prevailed.

KANES, W. H., Univ. South Carolina, Coumbia, S.C., HABIB LAZREG, E.T.A.P., Tunis, Tunisia, and R. EHRLICH, Univ. South Carolina, Columbia, S.C.

Regional Tectonics and Petroleum Geology of Tunisia—Introduction and Overview

Tunisia can be divided into five tectonic provinces: (1) La Galite–Numidian zone, (2) zone of diapirs–Zaghouan fault, (3) Kasserine Island, (4) Gabes basin–Cretaceous platform–Offshore, and (5) Djefarra-Paleozoic complex. Thin-skin tectonics dominate the La Galite–Numidian zone. Perhaps as much as 20 km of shortening indicates that the best petroleum prospects may lie beneath the thrusts. Oil and gas seeps in Algeria suggest that lower Numidian clastics induce favorable hydrocarbon generating environments. In the Kasserine Island area, as much as 5 km of late Miocene shortening complicates earlier extensional structures. Basement involvement in early extension and its possible influence on later compressive events could generate significant hydrocarbon accumulations. The section beneath the decollement also may have significant petroleum potential.

The zone of diapirs–Zaghouan fault, intermediate between the allochthonous Numidian–La Galite complex and the Kasserine Island may have potential beneath a possible decollement. Of particular interest are favorable autochthonous Jurassic facies. These prospects must have been generated during Early Cretaceous time with the subsequent trap improved during the Miocene orogeny. The Gabes basin–Cretaceous platform–Offshore province has well-developed extensional structures. Hydrocarbon source and maturation appear to be sufficient, as seen in the Isis and Ashtart fields. Reservoir quality is the major problem. The Paleozoic tectonic province has favorable extensional structures in the Djefarra complex, but source problems and tilting may have a negative effect. Paleozoic truncation plays south of the Djefarra are possible. However, large structures and thick reservoirs have not been found. The petroleum potential of Tunisia must be rated high, but only sophisticated and imaginative exploration programs will realize this potential.

KANES, W. H., R. EHRLICH, Univ. South Carolina, Columbia, S.C., and S. SCHAMEL, Lafayette College, Easton, Pa.

Tunisia—Plate Tectonics and Hydrocarbon Accumulation of Contiguous Areas

The position of Tunisia on the African plate is of importance to explorationists. Present work suggests that the African plate margin roughly coincides with the present northern African-Sicilian coastline. The eastern margin of this Algerian-Tunisian-Sicilian salient of the African plate is marked by the east coast of Sicily and the Malta Scarp. This sharply defined feature continues into the Gulf of Sirte where it joins with the post-Jurassic extensional Sirte basin. This represents a zone where eastern North Africa (Egypt and Cyrenaica) moved northeastward and western North Africa (Morocco, Algeria, Tunisia, and western Tripolitania) have a more northwesterly vector of movement. There may be a shear component in addition to the extensional faulting on the west side of the Sirte basin, which continues into the Malta Scarp.

Active rifting in Tunisia extends from Late Triassic through early Miocene with no appreciable compression. Miocene to Holocene compression is associated with collision along the northern continental margin. The Pantelleria trough and horst zone in central Tunisia developed in response to these stresses, as did the final tectonic framework of the zone of diapirs–Zaghouan fault and the Kasserine Island. These features buffered the Gabes basin and Cretaceous platform on the south from this compression.

This model defines as prospective all of northern Tunisia (except the northern Numidian zone), Sicily and the offshore Malta Bank, Gabes basin, and the Cretaceous shelf area.

KASSLER, P., Shell International Maatschappij, The Hague, Netherlands

Oil Generation and Migration in Lusitanian Basin, Portugal

The Lusitanian basin covers coastal Portugal and the adjacent offshore and received sediments from Triassic to Tertiary time. Presence of source beds, reservoirs, diapirs, and surface indications has attracted exploration since the late 1940s. Three principal potential source-rock zones have been identified from surface and subsurface work: Permian coals and Lower and Upper Jurassic kerogenous beds. The Permian coals occur only in localized basins and are of limited significance only as a potential gas source. The Lower and Upper Jurassic potential oil source rocks are confined to two subbasins in the center of the Lusitanian basin. Net source-rock thickness decreases from the subbasin centers toward the rims. Source maturity, established by various and independent techniques, appears to be rather low, suggesting a low resulting generation, expulsion, and migration efficiency. Surface indications and crude oil derived from tests support the hypothesis of a not very mature system. Although the subsurface data confirm the early interpretation that the Lusitanian basin contains the necessary basic ingredients for a successful exploration play (i.e., structures, reservoirs, source rocks), the absence of sufficient source maturation