INTERNATIONAL EXPLORATIONISTS

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STEVEN SCHAMEL—Biographical Sketch

Steven Schamel is currently Senior Associate Director and Research Professor at the Earth Sciences & Resources Institute at the University of South Carolina. He received his A.B. in Geology from Franklin and Marshall College, Lancaster, PA, and his M. Phil. and Ph.D. in Geology from Yale University.

Dr. Schamel has over twenty-four years of academic and research experience. His specialties lie in the fields of structural geology; tectonics; basin analysis; geothermal, subsidence, and maturation modeling of basins; construction of balanced cross-sections; and field mapping. During his research career, Dr. Schamel has conducted field studies in the Appalachians and North American Cordillera, the Northern Andes, the Alps and Apennines, Tunisia, and the Gulf of Suez. In addition, Dr. Schamel has made regional syntheses of other areas in the Mediterranean Basin, North Africa, the Middle East, northwestern South America, and the Soviet Union.

GEOLOGIC EVOLUTION AND HYDROCARBON PROSPECTS OF THE GAFSA TROUGH, CENTRAL TUNISIA

The Gafsa Trough of onshore central Tunisia is one of the more interesting and underexplored features of North Africa. It is a 5-12 km. deep, east/west-trending depression along the inner edge of the Tunisian-Libyan shelf margin. The basin has had a long and virtually uninterrupted history of subsidence from the late Paleozoic into the early Cenozoic. A substantial portion of the trough remains, at present, a broad physiographic depression, the Chotts. Subsidence began in the Late Carboniferous, soon after the close of the Hercynian orogeny, and resulted in deposition of a 3000+ meter succession of Permo-Carboniferous carbonates and shale that pinches out southward onto the Saharan Flexure. The tectonic setting for this earliest phase of subsidence is not clear. The main episode of subsidence, which began in the Middle Triassic, continued through the Jurassic as left-lateral, transtensional rifting along the South Saharan and Maghrebian Shear Zones. This event led to the separation of Europe and Africa and the development of the broad, highly differentiated, North African passive margin. The Gafsa Trough is one of several deep, linear basins developed on this transtensional shelf margin.

The southern margin of the basin is a simple north- and northwest-dipping homocline broken by small down-to-basin normal faults. The northern margin against the Kasserine Platform has considerably lower structural relief but is marked by a complex system of normal and reverse faults. The axis of the trough deepens to the east and west away from a broad saddle between Tozeur and Kebili. Late Cretaceous-Tertiary compression has further modified the configuration of the basin.

The Gafsa Trough developed on the erosionally beveled and rifted northern flank of the late Paleozoic Talamzane Arch. Middle Paleozoic sediments, including organic-rich Lower Silurian shales, appear to underlie the basin. The trough is filled with several distinct successions of sediments: Permo-Carboniferous carbonates and clastics locally exceeding 3000 meters in thickness; 100-2000 meters of Triassic-Liassic basal sands and evaporites; and a 6000- to 8000-meter-thick succession of Middle Jurassic to lower Tertiary marine to paralic carbonates and clastics. Basal Triassic and underlying Paleozoic strata are considered too deeply buried in the Gafsa Trough to be reasonable exploration targets. The most prospective target is sand lenses within the Middle-Upper Jurassic clastic/carbonate basin fill. In the extreme eastern part of the basin, commercial quantities of hydrocarbons have recently been discovered in these sands.

Maturation modeling suggests that the Lower Silurian source rocks beneath the deeper portions of the Gafsa Trough are over-mature, even for generation of dry gas. Furthermore, Paleozoic source rocks beneath virtually all of the trough had passed beyond the "wet gas" generative stage by mid-Cretaceous time. Everywhere north of the Saharan Flexure potential Paleozoic source rocks are highly mature to overmature. The Middle-Upper Jurassic basinal shales in the deeper, central portions of the Gafsa Trough entered the oil generative window as early as mid-Cretaceous time and into the gas generative window in the Late Cretaceous to early Tertiary. These possible source rocks are mature to highly mature beneath nearly all of the basin. The Gafsa Trough is a probable gas province, with occurrences of condensate possible.