Crude oils and rock samples from carbonate basins in France (Aquitaine), Guatemala, Iraq, and Tunisia/Libya were analyzed by the usual methods of organic geochemistry. The studies were based mainly on computerized gas chromatography–mass spectrometry, with special emphasis on mass fragmentography. Several classes of biological markers were used for the purpose of characterizing the environments of deposition and for correlating crude oils with source rocks. The following specific features commonly were observed in the oil and rock samples from these carbonate formations: (1) the predominance of normal alkanes with even carbon numbers, usually more pronounced in the rocks than in the oils; (2) a ratio of pristane to phytane mostly below 1; (3) the presence in significant concentrations of the higher homologs of the hopane triterpanes, up to C_{35} (more important in rocks than in oils); (4) usually small amounts of steranes (C_{21}–C_{23} and C_{27}–C_{29} ranges), with predominance of non-rearranged structures; and (5) commonly an unusually high concentration of individual isoalkanes (C_{23}) and cyclohexylalkanes (C_{21}).

These molecular criteria partly reflect an important microbial contribution, which is usually more pronounced in highly anoxic environments. Furthermore, they have been used successfully in correlations among crude oils and between crude oils and their source rocks. The results agree with other geochemical and geological data.

Geochemistry of Crude Oils and Crude-Oil–Source-Rock Correlations in Four Carbonate Basins

Jacques Connan
Société Nationale Elf-Aquitaine, Pau, France

Georges Hussler and Pierre Albrecht
Université Louis Pasteur, Strasbourg, France

The giant fields of the Zagros fold belt of southwestern Iran fall within the greater context of the Arabian–Iraq–Persian basin and contain cumulative recoverable reserves estimated at 87 billion barrels of oil and 514 trillion cubic feet of gas.

The regional geology of the area comprises a wedge of Paleozoic to Holocene sediments, 10–15 km (6–9 mi) or more in thickness, supported on a mobile Eocambrian salt economic basement. Forming a classic carbonate–evaporite sequence, the succession contains prolific source–reservoir combinations and effective seals of integrity. Located on the eastern subducting boundary of the Arabian plate, hydrocarbon generation has been largely controlled by the Neogene Zagros orogenic event. A number of potential source sequences have been recognized. With one exception, all are typically of an organic-rich, argillaceous, lime-mudstone litho-textural type.

Most of the giant oil accumulations in Asmari (Oligocene–Miocene) and Bangestan Group (Upper Cretaceous) reservoirs have a common provenance in the Kazhdumi Formation of Early Cretaceous (Albian) age. The Pabdeh (Paleogene), lower Garau–Gadvan (Lower Cretaceous, Neocomian), and Sargelu (Middle Jurassic) formations contribute less to overall reserves, having been the source for selected subordinate Asmari, Bangestan, and Khami Group (Upper Jurassic–Lower Cretaceous) reservoirs only. Gas in Permian–Triassic reservoirs has a provenance in Ordovician–Silurian siliciclastics.

Carbonate Source Rocks for Six Million Barrels of Oil per Day—Zagros Fold Belt, Southwestern Iran

R. Burwood
Petrofina UK, Ltd., Epsom, Surrey, England