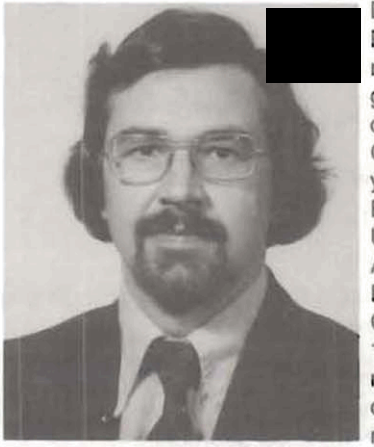
PLATE TECTONICS, ORGANIC-MATTER TYPE, AND BASIN EVALUATION FOR PETROLEUM POTENTIAL

The concepts of plate tectonics have been used to classify sedimentary basins in terms of physical characteristics, such as location on the plate and geothermal gradient. A complete classification must include the amount, type, and distribution of organic matter because this is the material that generates petroleum. Organic matter can be divided into that which grows on the land surface (terrestrial) and that which grows in water (aquatic). This is an economically important distinction because aquatic materials produce normal crudes whereas terrestrially derived materials produce gas and waxy oil. Transport of terrestrial organic matter to areas of deposition depends on surface relief because this controls drainage patterns. The association of transported terrestrial organic matter with clastic sediments makes deltas the most gas-prone depositional environment. Organic materials are not distributed uniformly in deltas because terrestrial organic matter has its highest concentration nearshore and aquatic material is produced in large amounts offshore. This separation and distribution lead to gas fields near paleoshorelines and oil farther out. As the delta progrades, terrestrial organic matter is deposited over the previously deposited aquatic organic matter, producing a vertical sequence from gas to oil in the delta. Sediments on subducting plates should show the same vertical sequence of terrestrial over aquatic material because the slow transport of sediments toward the source of terrestrial organic matter causes its concentration to increase as the subduction zone is approached. The opposite trend (i.e., aquatic over terrestrial) is found on pull-apart margins where the oldest sediments were formed in a continental rift rich in terrestrial organic matter and were overlain by sediments containing increasing amounts of aquatic organic matter. The distribution of organic-matter types exercises primary control over the distribution of oil and gas.

NOON MEETING—DECEMBER 14, 1977

COLIN BARKER—BIOGRAPHICAL SKETCH



Dr. Barker was born in Plymouth, England. He received a Bachelor's degree in Chemistry and a doctorate in Geology from Oxford University. After 2 years as a postdoctoral Research Fellow at the University of Texas at Austin, he joined Exxon Production Research Company in Houston in 1967. He became a faculty member at The University of Tulsa 2 years later and is now Professor of Geochemistry and Chairman of the Division of Physical Sciences (which includes Physics, Chemistry, and Earth Sciences). Dr. Barker is active as a consultant and is a lecturer for the AAPG Continuing Education program. He is a member of the Geochemical Society, AAPG, North American Thermal Analysis Society, and the Tulsa Geological Society. He is currently Chairman-elect of the Organic Geochemistry Division of the Geochemical Society.