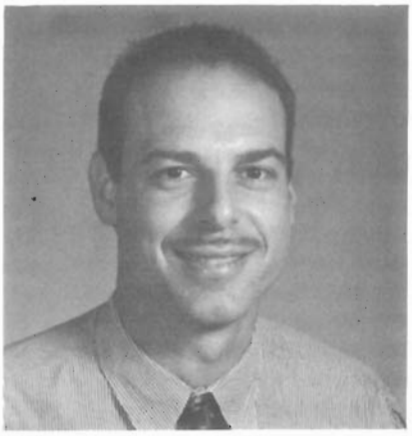
EMERY D. GOODMAN - Biographic Sketch



Emery D. Goodman is a Research Specialist in the Integrated Basin Analysis Division at Exxon Production Research Company. He received his B.S. degree from Stony Brook University and then his M.S. degree from the University of South Carolina. In his thesis work, he investigated the dispersal and provenance of modern terrigenous sands, northern Puerto Rico. In 1980, Goodman joined Shell Oil Company in New Orleans, exploring for oil and gas in several onshore and offshore Gulf of Mexico plays. He left Shell in 1985 for graduate school at the University of California, Santa Barbara and there received his Ph. D. in 1989. His dissertation addressed the structure and evolution of the southern San Joaquin Basin and the regional tectonics of central California. He joined EPR later that same year, working on the regional geology of southwest Asia. Goodman has worked on the geology of western China on and off since 1990 and did some field work there earlier this year. He lives in west Houston with his wife and two sons.

WILLIAM L. "BILL" LINDEMANN - Biographic Sketch

William L. "Bill" Lindemannis a native Texan who received his Bachelor of Science and Master of Arts degrees from the University of Texas in Austin. He began his employment with Humble Oil & Refining Company in 1960 as a summer student in new Iberia, Louisiana. His career with Exxon has included both domestic and foreign oil exploration, minerals exploration and solution mining, and coal and synthetic fuels exploration. He has spent the past eleven years exploring for oil and gas in the Far East and the past seven years working the geology of onshore China. His present assignment is Geological Advisor for the Far East Business Unit of Exxon Exploration Company at Greenspoint.

ALAN R. CARROLL - Biographic Sketch

Alan Carroll is a Research Specialist with Exxon Production Research Co. in Houston. He received a B.A. in geology from Carleton College and an M.Sc. in carbonate sedimentology from the University of Michigan, Ann Arbor. He worked for three years for Sohio in Dallas as an exploration and production geologist in the Anadarko basin. He received his Ph.D. in sedimentary basin analysis from Stanford University on the tectonics, sedimentation, and organic geochemistry of the upper Paleozoic of the Junggar and Tarim basins, northwest China. He has worked four field seasons in western China and Mongolia, and has authored or co-authored several publications on western China.

INTERNATIONAL EXPLORATIONISTS

Tectonic Controls on Basin Evolution and Hydrocarbon Occurrence, Western China

by Emery D. Goodman, William L. Lindemann, Alan R. Carroll

International Explorationists Dinner Meeting – November 15, 1993
Social Period, 5:30 p.m., Dinner and Meeting, 6:30 p.m.
Post Oak Doubletree Inn

Reports of significant hydrocarbon discoveries and the current tender offering in the Tarim Basin have focused worldwide attention on the basins of the Xinjiang Uygur Autonomous Region. Regional information has been synthesized to analyze and evaluate these complex, multiphase basins. The Tarim, Junggar and Qaidam Basins have unique basin histories, but share common attributes linked to plate convergence and sequential amalgamation onto Eurasia beginning in middle Paleozoic time. Basement rocks surrounding these basins include continental crust, ophiolites, blueschists, arc terranes and metasediments. A general outline of tectonic events is as follows: the Junggar 'block" was consolidated out of island arcs, oceanic fragments and accretionary material and was sutured onto the southern margin of Eurasia in the mid-Paleozoic. In contrast, the Tarim plate likely rifted away from a southern hemispheric landmass in the late Precambrian, then traveled northward as a microcontinent, with a thick platformal section. Tarim collided with the Central Tian Shan microcontinental block, in low northern paleolatitudes, during the Late Devonian/Early Carboniferous. This collision is marked by a widespread angular unconformity, by Devonian red beds, and by a Carboniferous flexural foredeep located along the northwestern margin of the Tarim Basin. The resultant Tarim/Central Tian Shan Block later collided diachronously with volcanic arcs in the North Tian Shan/Bogda Shan region in the Late Carboniferous, uplifting a paleo-Tian Shan Range which shed sediments into both the southern Junggar and northern Tarim basins. Meso-Cenozoic collisions added the North China, Qiangtang, South China, Lhasa, and Indian continental blocks. The latter collision and continued convergence drives vigorous uplift of basin-bounding ranges, flexural subsidence of adjacent depocenters and extensive strike-slip deformation. This deformation has resulted in over 20 km vertical structural relief over a distance of only 200 km between the southwest Tarim basin and the adjacent Kunlun Mountains.

Structural features, subsidence histories, and strata of the western China basins demonstrate strong linkages between their tectonic evolution and the timing and distribution of exploration play elements. Episodic block collisions produced regionally variable, repeated, tectonostratigraphic responses in these basins, locally affecting the development or demise of hydrocarbon systems. The collisions can be tied to episodes of both basement-involved and detached contraction, and to the inversion of Precambrian to early Cambrian normal faults. In addition to trap generation, the depositional, burial and diagenetic histories of source, reservoir, and seal units were also affected. For example, the lower Paleozoic section of the northern and central Tarim Basin was repeatedly uplifted, tilted and eroded, as indicated by a series of regional angular unconformities and by reverse faults. The generally low reservoir quality of these carbonate rocks was locally enhanced by collision-related fracturing, and by subaerial leaching or karsting. Rich, thick, Upper Permian, lacustrine source rocks (up to 34% TOC) were deposited and preserved in the Junggar Basin after the Tarim/Tian Shan and Junggar blocks were amalgamated. The paleo-Tian Shan may have enhanced lake formation by providing an orographic effect on local climate, resulting in higher rainfall on the Junggar side. In the Qaidam Basin, Paleozoic strata were deformed during collision along the south margin of Tarim, limiting their potential as reservoirs. Post-Paleozoic, non-marine, organically-rich rocks are found in at least four western China basins. Widespread Jurassic coaly shales may reflect synchronous flexural subsidence responses to regional tectonic events in these basins, all lying within a warm, temperate climate. Repeated Mesozoic and Cenozoic episodes of subsidence and clastic sedimentation, especially along basin margins, provided maturation for Paleozoic/Mesozoic hydrocarbon systems. However, Lower Paleozoic source rocks are presently overmature in the deepest portions of the Tarim Basin.