# SHALE DOME EXPLORATION IN THE GULF COAST

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## ABSTRACT

Diapiric shale masses are formed along certain trends during favorable geologic times, mainly by the geologic process known as "sedimentary volcanism". A thorough understanding of this process is the key to interpreting the origin and growth of diapiric shale masses and their tremendous hydrocarbon reserves and potential in the Gulf Coast.

Diapiric shales produce negative gravity anomalies because of low densities. Density logs show densities to be almost as low as salt. Low velocities (indicated by sonic logs) cause shale-mass structures to be mapped seismically as "lows" instead of "highs", unless correct velocity functions are used.

Explorationists must note the similarities and emphasize the differences between shale-dome and salt-dome exploration. Although intrusive shale plugs exhibit the same pronounced structures as salt plugs, buried extrusive shale masses are generally not associated with pronounced radial faulting, sharply upturned beds or other commonly recognized structural attributes of intrusive masses.

A common clue to subsurface diapiric masses is half-ohm resistivity (IES log) caused mainly by high water content of the shale. Few correlations, if any, can be made within the diapiric mass. An abnormal microfaunal sequence is nearly always encountered, as is high pressure shale gas. Because of their greater magnitude and distinguishable direction, mudflow dips within an extrusive mass can often be recognized by a dipmeter survey. Dips recorded within an intrusive shale plug or a "shale sheath" should be random in both magnitude and direction. Sidewall cores within a diapiric mass reveal churned shale pellets and gas bubbles in the shale units; and disrupted sand-grain frameworks in the sandstones.

Sandy, water-filled, gas-churned mudflows are high porosity, low permeability masses that serve as barriers to hydrocarbon migration. Intrusive structures have had a timely injection in order to trap migrating hydrocarbons whereas extrusive shale masses are unique barriers because the barrier is present before or during deposition of the adjacent beds.

Shale structures and associated hydrocarbon traps are illustrated by seven fields in the Louisiana and Texas Gulf Coast.

BIOGRAPHICAL SKETCH - Paul S. Freeman

Paul S. Freeman is a native of Pharr, Texas in the Lower Rio Grande Valley. He attended the U.S. Military Academy at West Point and the University of Texas at Austin. After receiving a B.A. in Math (1959) and a B.S. in Geology (1960), he was employed in Mexico on a mercury exploration program by P. G. Lake, Inc. He later served on active duty with the Corps of Engineers and returned to graduate school at the University of Texas where he received the M.A. degree in Geology.

He was employed as an exploration geologist with Union Oil of California both in Houston and New Orleans from 1963 to 1967. He returned to Houston in 1967 with Texas Oil and Gas Corp. and since 1969 has been a consulting geologist here.

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