Wildcat exploration for the elusive 1st Cat Creek pay zone will require detailed stratigraphic studies accompanied by careful well-site sample analysis, well-chosen suites of electric logs, and modern gas-detection equipment.

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Paleoecologic Determination of Bathymetric Position of Organic Buildups—Example from Lower Paleozoic of Appalachians

Bathymetry of organic buildups may determine their reservoir potential. Whether a buildup was formed on a shelf, at a shelf edge, or downslope toward a potential source basin may determine distance of hydrocarbon migration, porosity and permeability history, and reservoir "sealing" events. Although there are physical paleobathymetric indicators, the most sensitive criteria are paleobiologic in nature. Our case study example involves several buildups in the Appalachian Ordovician. Depth was initially established on sedimentologic and stratigraphic bases; paleoecologic analysis of upslope versus downslope buildups led to generalizations which may apply to other Paleozoic buildups. Shelf, upslope, and downslope buildups have features in common such as abundant and diverse echinoderms, gray to red mudmounds, and abundant cross-bedded grainstones (although cross-beds are of different origin in shallow and deeper locales). Significant paleoecologic differences exist. Upslope and shelf buildup communities were dominated by echinoderms and arborescent bryozoa, with red and green algae. Some encrusting red algae were binders of mud-mounds. Endolithic borers were abundant. Downslope buildups were constructed by echinoderms, and encrusting bryozoa acted as binders of mudmounds; algae are absent, and evidence of boring is rare.

Ecologic distinction between the settings may have resulted from differences in light intensity, abundance of suspended organic detritus in bottom waters (a resource derived from shelf areas), and the height above the sediment of suspended food. In shallow water, resuspended detritus allowed suspension feeding at many levels while deeper water conditions allowed suspension feeders, chiefly bryozoa, only very near the bottom.

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Evaluation of Uranium Potential of Frontier Areas by Functional Source-Rock Analysis

Rapid, inexpensive evaluation of the potential of frontier areas for epigenetic uranium deposits can be conducted using functional source-rock analysis analogous to that employed in the petroleum industry. Association of uranium-rich volcanic glass with nearly all such deposits suggests that their uranium came from glass. Concentration of uranium in ores is about 10^3 times that in glass-rich sources, so great volumes of depleted rock should mark favorable areas.

Fresh rhyolite glass contains uranium adsorbed on shard surfaces, soon washed off, and 5 to 10 ppm internal uranium, which is released when the glass converts to a crystalline assemblage. Only under certain circumstances does released uranium migrate. Studies conducted in south and west Texas and in Nevada on volcanic rocks and sediments that originally contained abundant volcanic glass lead to the following conclusions: conversion in soil or by very early diagenesis, and low temperature conversion of glassy ash flows to clay release uranium for migration; high temperature conversion by divitrification or vapor phase crystallization and diagenesis in open hydrologic systems trap uranium near its site of release. Structures and textures produced during each of these processes are distinctive and can be recognized in the field or in thin section. Furthermore, the processes probably produce distinctive chemical effects other than depletion of uranium. Functional source rock exploration for uranium consists of field, petrographic, and geochemical detection of depleted rock that altered in a favorable fashion. Evaluation of likely migration routes; geologic, geochemical, and radiometric exploration for traps; and drilling programs can then be concentrated in the most favorable areas.

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Seismic Stratigraphy in Low-Energy Carbonate Depositional Environment

Seismic stratigraphic mapping in carbonate rocks has been historically concentrated on the shelf margin environment where unit geometry and abrupt facies-velocity changes are often easily discernible with the seismic tool. In contrast, low-energy, more subtle shelf interior statigraphic features have attracted less geophysical attention. This report describes the study of seismic data from five United States oil fields which produce from reservoirs formed from shelf interior deposits. Three Smackover fields, a Permian basin producer, and a Williston basin example are compared.

Review of the depositional model indicates the difficulty of seismic mapping in non-reef carbonates. If sedimentary accretion is nearly vertical, porosity traps are predicted to exhibit only lateral change in unit velocity. In regressive or transgressive sequences, the geologic model indicates that angular discordance due to sediment buildup in combination with a velocity contrast generates an angular feature that has a different velocity pattern. These five fields provide examples of both trap types.

Jay field (Florida) and Walker Creek field (Arkansas) both produce from the Smackover Formation and are (seismic-defined) stratigraphic traps which illustrate angular discordance and velocity contrast owing to regressive buildup. The trapping mechanism at Big Escambia Creek (Alabama), also productive from the Smackover, is from a transgressive pulse devoid of vertical buildup. Hence, the porosity trap is indicated only by a lateral velocity change without angular discordance.

Subsurface geologic sections of San Andres produc-