Geologists and geophysicists have made little effort to purposefully search for the subtle traps—stratigraphic, unconformity, or paleogeomorhic—because of (1) motivation to continue looking for structures which can be found with present-day tools and ideas, and (2) the pressure exerted on explorationists by their knowledge that anticlines, domes, and fault structures are more acceptable to management. As a result, our domestic exploratory successes during the past decades have been declining not only in number of fields found annually, but also in the quality or economic worth of the fields.

Hidden trends may occur below unconformities, at undrilled depths in productive trends, and in relatively unexplored regions. Hidden features may be ancestral anticlines and domes, faults, stratigraphic traps, and buried geomorphic features. The difference between these hidden features and the obvious type is that the former are not obvious to present-day exploratory methods and thinking. Many of these probably can now be found, but only if we point our methods and thinking toward them, not around them.

Domestic explorationists must make a turn in the direction of purposefully looking for the obscure trap. The large domestic reserves required for the future are contained in hidden trends and features. If we are to succeed in finding them, geologists and geophysicists, and, equally, management, will have to place greater emphasis on the deliberate search for the subtle trap. In this search, emphasis must be placed on detailed study and research in stratigraphy, paleogeomorphology, paleogeography, paleostructure, paleontology, and palynology.

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Burial Cement in Sunniland Reservoirs, Lower Cretaceous of Southern Florida

Loss of porosity in the Sunniland Limestone is the result of processes associated with burial of the formation to its present depth of about 3,400 m. Early diagenetic alteration was a relatively minor factor in porosity loss. Significant processes which reduced porosity are mechanical compaction (dewatering, grain fracture, and deformation), chemical compaction (stylolitization, both on a macro and micro scale, and interpenetration of grains along contacts), and burial cementation. Burial cements, the product of chemical compaction and calcite solution transfer, are most evident in grainstones, including Sunniland reservoir rocks.

Three petrographically distinct burial cements are recognized as: (1) scalenohedral or dogtooth calcite, of grain size generally less than 100 μm, filling primary porosity and fractured by burial pressure; (2) equant or blocky calcite, of grain size generally larger than 100 μm, filling primary, secondary, and fracture porosity, and commonly poikilotopic; and (3) equant or baroque dolomite, of grain size generally larger than 100 μm, filling primary, secondary, and fracture porosity, occasionally poikilotopic, with larger grains exhibiting undulatory extinction and curved crystal faces.

These cements account for as much as 30 to 40% porosity loss in some grainstones and are present to a lesser extent in most reservoir rocks.

Isotopic analyses of cements ($\delta^{18}O$, $\delta^{13}C$) and water ($\delta^{18}O$) are consistent with an interpretation that these cements formed in the subsurface over a range of temperatures (about 40 to 100°C) in pore water that was continually modified by dissolving Suniland calcite. Quantification of these processes requires accurate predictions of the rate of calcite solution transfer. Estimates of this parameter suggest that very little cement is precipitating now and that most cementation was complete before the Oligocene (burial depth about 3,000 m).

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Facies Anatomy of Modern Continental Sabkha, Bristol Dry Lake, California

Bristol Dry Lake is a 155-sq km fluvial-lacustrine dominated, continental sabkha, or playa, in the Mojave Desert of southeastern California, and is filled with at least 300 m of interbedded terrigenous clastics, gypsum, anhydrite, and halite. The evaporite facies roughly form a bull's-eye pattern with abundnat gypsum and anhydrite surrounding a basin center accumulation of halite. Transects through Bristol Dry Lake, from the alluvial fan and sand flat to the center of the playa, reveal (1) crudely bedded, coarse-grained clastics prograding over and interfingering with either (2) wadi (alluvial/eolian) sand and silt, or (3) mud-flat facies of nodular to enterolithic gypsum or anhydrite and blades of gypsum in red-brown silt and clay, followed by (4) saline mud-flat facies of red-brown silt and clay crowded with giant (15 cm diameter), displacive, hopper-shaped crystals of halite, and (5) salt-pan beds of chaotic mud-halite up to 4 m thick in the center of the playa.

Deposition of terrigenous clastics was by fluvial-sheetflood processes around the toes of alluvial fans, fluvial flow through very shallow rills and suspension settling in the mud-flat environments. Much of the sediment is reworked by eolian processes. Evaporites are precipitated at or just below the sabkha surface from discharging brines.

Lithofacies of this modern continental sabkha are nearly identical to those comprising the Middle-Upper Permian evaporites of the Texas and Oklahoma panhandles, and they are excellent process analogs for ancient facies analysis.

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Control of Early Carbonate Diagenesis by Carbon Dioxide Production and Loss

The early diagenesis of recent marine carbonate sediments is pervasive and rapid in coastal ground-water systems characterized by the dynamic influx and mixing of meteoric and marine waters. In coastal areas subjected to high and continuous seaward fluxes of meteoric water, such as the eastern coast of Yucatan, extensive dissolution and removal of carbonate result simply from the physical mixing of meteoric and marine waters. However, comparative studies of coastal phreatic systems on St. Croix, Bermuda, and Jamaica demonstrate that where there is a marked seasonal variation in the influx of meteoric waters, carbonate dissolution and precipitation become progressively controlled by the in-situ production and loss of CO_2. In seasonally variable systems, rates of CO_2 production are controlled primarily by the availability of oxygen and the abundance and type of organic water episodically introduced into the pore waters and sediment. Rates of CO_2 loss are controlled by the dissolution of carbonate and by vertical mass transport resulting from the spatially and temporally variable processes of diffusion, dispersion, and hydraulic pumping.

A quantitative mass transport model has been developed to evaluate the diagenetic response of a vertical, magnesian