ductive of oil and gas. It is proposed that this group of related fields be termed the Scotts Bluff trend. Subsurface mapping indicates that recurrent movement along Precambrian basement faults has enhanced reservoir quality and localized oil migration, favoring oil accumulation along the trend.

The J Sandstone dips gently southwest across the northeastern Denver basin. Low-relief closures and structural noses are critical elements in several structural-stratigraphic traps. However, most of the traps are controlled primarily by an updip facies change from porous, permeable sandstone to siltstone and shale.

Most oil production is from the J_1 member, whose commercial production limits coincide with porous sandstone bodies at least 5 ft (1.5 m) thick. Three fields each have produced over 1,000,000 bbl of oil. The J_1 was deposited in elongate, elliptical, northwest-trending marine bars that are rhythmically separated by laterally equivalent shales. The central-bar facies, which includes most of the reservoir rock, grades into bioturbated bar-margin siltstones which, in turn, grade into interbar shales.

Long-distance lateral migration into the shallow reservoirs of the trend from thermally mature shales of the Dakota and Benton Groups near the basin's axis is indicated. Recognition of the trend's characteristics will reduce exploration risk and help realize the area's considerable economic potential.

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Dolomitization by Thermal Convection in Carbonate Platforms

Thermal convection may be a significant dolomitizing ground-water flow process in active carbonate platforms. In platform margins there is an upward transfer of seawater from the surrounding ocean depths. This motion is induced by the strong horizontal density gradient that exists between the warmer platform interior (warmed by geothermal heat flux) and the cold surrounding ocean waters. The cold dense seawater flows inward displacing the platform pore waters upward. This flow process was discovered and studied in south Florida by Francis Kohout. Here these upwelling waters discharge from well-known submarine springs on the shelf and shelf edge. The waters are of seawater composition but with increased Ca/Mg suggesting that they have acted as dolomitizing fluids. In Florida this flow pattern is distorted by and mixed with the large regional flow of the Floridan aquifer. In isolated platforms this distortion should not occur. To test the idea that this kind of convection might be an important diagenetic agent in platform settings in general, I have used ground-water flow theory to model this process in isolated platforms. Approximate theory suggests that Darcy velocities of 1 m/yr (3 ft/yr) occur. I am using boundary layer theory to determine the fully developed flow pattern and the distance from the margin to which the flow penetrates. The rate of dolomitization that could be developed by this process is comparable to and may exceed that of other flow processes in active platforms. I conclude that this "Kohout convection" is a large-scale flow process that appears capable of pervasive dolomitization of platform margins.

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Bituminous Sandstone Resource Evaluation of PR Spring Deposit, Uintah and Grand Counties, Utah

The Laramie Energy Technology Center (LETC), Department of Energy, completed a seven-corehole drilling program in 1980 at the PR Spring tar sand deposit, southeastern Uinta Basin, Utah. The core data from these locations were integrated with data from 70 other locations to update the following deposit characteristics: vertical and aerial extent, stratigraphy, and rock properties. Oil-impregnated sandstones are found as surface outcrops and to depths of 475 ft (145 m). Three main tar sand zones in the Douglas Creek Member of the Eocene Green River Formation were correlated across the deposit. Up to 27 separate tar sand beds were identified across the deposit, ranging from 1-35 ft (0.5-11 m) thick. These saturated zones and beds are lenticular and discontinuous, both vertically and horizontally. Analytical results from 6 of the LETC cores and 32 other cores were interpreted to further evaluate the deposit. Computer-generated isopleth maps identified the following general trends: the thickest zones are found in the south-central portion of the deposit; extracted permeability and extracted porosity decrease downdip (northwest); oil saturation decreases to the west-southwest; and water saturation decreases to the east.

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Electrochemical Aspects of Hydrocarbon Reservoirs and Surface Seeps

Recent theoretical studies have enabled speculative predictions to be made of likely natural (as opposed to induced) electrical potentials above reservoirs. Due to improved instrumentation, these potentials can now be tested in the field. Most oil and gas traps are somewhat leaky, and the buoyant and highly reducing hydrocarbons create a redox chimney. This inevitably develops a potential field, because subsurface formations are rarely dry, and deeper formation waters may be rich in salts and thus have low resistivities. However, subsurface rock packages are also inhomogeneous and highly anisotropic with respect to electrical and fluid properties. Dissolved salts, rates of fluid flow, charged scale membrane effects, chemical reactions, pH, Eh, etc, affect the electrical current pattern and polarity. Consequently, natural cells can be very complex.

The most important geobatteries to be expected around hydrocarbon traps will be affected by interacting ionic changes, cells of various types, pressure, temperature, concentration changes, and electrokinetic phenomena.

Tectonic, sedimentational, and diagenetic influences will affect electrical potentials and local conductances, both of which are amenable to measurement in the field.

The models that we propose are simplistic, because only these are readily amenable to theoretical analysis; chemically "dirty" natural systems are much more complicated. However, it is hoped that this approach will stimulate dialogue and criticism that will benefit this too-long-ignored subject.

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Comparison of Predrilling Predictions with Post-Drilling Outcomes, Using Shell's Prospect Appraisal System

Since 1975 Shell Internationale Petroleum Maatschappij has used a Monte Carlo simulation model for worldwide prospect appraisal. The input parameters to this model describing charge (oil and gas available for trapping and retention), structure, reservoir, and retention (seal characteristics) are given in the form of probability distributions. For the estimation of charge and retention, the model follows a scheme of Bayesian update, using equations derived from calibration studies, i.e., statistical analysis of extensive data sets with a worldwide distribution.

Comparison of predrilling predictions with postdrilling results shows that the underlying calibration procedure is statistically sound and also demonstrates the importance of assessing geologic uncertainty in a quantitative manner. Geologists appear to have been fairly successful in describing the geologic setting of prospects in respect to hydrocarbon charge and retention (the calibrated parts of the system), but serious overestimation/overconfidence have occurred in respect to reservoir parameters and such risks as existence of trap (the uncalibrated parts of the system).

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Fluid Inclusions in Burlington Limestone (Middle Mississippian)—Evidence for Multiple Dewatering Events from Illinois Basin

Syntaxial calcite cements and dolomite from crinoidal limestones in the Burlington formation, southeastern Iowa and western Illinois, contain 2-phase fluid inclusions which represent samples of the diagenetic fluids. A U.S. Geological Survey-type heating/freezing stage was used to determine the homogenization temperatures, bulk salinities, and major dissolved salt compositions of the inclusions. The calcite- and dolomite-hosted inclusions have mean homogenization temperatures of 85°C (185°F) and 109°C (228°F), respectively. Mean bulk salinities are