grading sabkha sequence. Correlation of log markers demonstrates considerable bottom topography along prograding clinoform ramps in the lower Madison and the irregularity of the advancing evaporite complex in the upper Madison. Many marker horizons pinch out against the clinoform slopes or the prograding evaporites, leaving few regionally traceable markers below the Polar interval. The Madison has a high potential for multiple reservoir development and for multiple stratigraphic traps where pinch-outs and lateral gradations occur.

In contrast, log markers in the Bighorn Group extend regionally. The lithologies represented by the markers are also consistent regionally. Several discrete, nonlaterally intergrading events in the upper Bighorn are marked by sharp transitions upward from burrowed, mud-rich carbonate through laminated dolomudstone to anhydrite. The regional persistence of lithofacies, their relatively uniform thickness, and the long distance correlation of log markers indicates both long and short term depositional stability over nearly uniform bottom topography. Deposition took place in a very shallow sea that graded to a carbonate marsh or swamp environment over the entire Williston basin region. Reservoirs are developed at consistent stratigraphic horizons, and the possibility of stratigraphic traps is limited under these conditions.

Just as Madison starved-basin depositional styles in the Williston basin are consistent with Mississippian depositional styles in the Illinois basin and elsewhere in North America, Ordovician depositional styles, representing shallow stable conditions, extended across the Transcontinental arch into the Illinois basin and elsewhere. Contrasting styles of sedimentation and reservoir development in the same basin at different times require different exploration strategies. These contrasts must be considered when developing multiple objective programs.

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Walker Lake, Nevada: Sedimentation in an Active, Strike-Slip Related Basin

Walker Lake, Nevada, is in an active fault-controlled basin related to the right-lateral, northwest-trending Walker Lane Shear Zone on the western side of the Basin and Range province. The lake occurs in a half graben bounded on its west side by a high-angle normal fault zone along the Wassuk Range front. This fault zone may merge to the north into the Walker Lane fault system, which forms the northeast boundary of the basin. To the south of Walker Lake, the Wassuk front fault merges with an east-northeast trending left-lateral fault. The Walker Lake basin is interpreted to be a pull-apart basin formed within the triangular zone bounded by the Wassuk front, the Walker Lane, and left-lateral faults.

The Walker River drainage basin occupies about 10,000 km^2 (3,800 mi^2) in western Nevada and parts of California and is essentially a closed hydrologic system that drains from the crest of the Sierra Nevada in California and terminates in Walker Lake. Walker Lake trends north-northwest and is 27.4 km (17 mi) long and 8 km (5 mi) wide with water depths exceeding 30 m (100 ft). Lake Lahontan (Wisconsinian) shorelines ring Walker Lake and suggest water depths of 150 m (500 ft) above the present lake level. The lake is situated in an asymmetric basin with steep alluvial fans flanking the western shoreline (Wassuk Range) and gentle, areally more extensive fans flanking the eastern shoreline (Gillis Range). The Walker River delta enters the lake from the north and is a major sediment point source for the basin. Older dissected shoreline, alluvial fan, Gilbert delta, and beach ridge deposits were built largely of coarse-grained, locally derived materials. Stromatolites, oncolites, and tufas formed along the shorelines, whereas mud and organic sediments accumulated in the lake on the west side of the basin. Extensive submerged sand flats and local sand dunes occur on the east side of the basin.

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Tectonic Evolution of Sevier-Laramide Foreland Structures from Latest Jurassic Through the Eocene

Sevier-Laramide overthrusting was generated by both relative North American (NA)-Farallon and absolute NA plate motions. The magmatic arc thermal axis (MATA), adjacent thermally weakened hinterland metamorphic "core" (HMC), and mechanical anisotropies in the upper crust contributed to variations in thrust belt development. Latest Jurassic to earliest Cretaceous west-northwest-directed absolute motion of NA plate collapsed the Cordillera toward the east-southeast, causing southeast to east vergent thrusting along the hinterland and Sevier thrust belt. Relative NA-Farallon and absolute NA plate motions increased dramatically in the mid-Cretaceous between 105 and 85 m.y.B.P. causing the MATA-HMC to migrate eastward. Rapid west-northwest absolute motion of NA collapsed the Cordillera toward the east-southeast, causing major southeast to east vergent thrusting along the Sevier thrust belt. Absolute NA motion slowed after 85 m.y.B.P., but increasing relative NA-Farallon motion forced shallowing of Farallon subduction angle and further eastward migration of the MATA-HMC. This allowed relative plate convergence stresses to be transferred into the Laramide foreland (LF). Latest Cretaceous-Paleocene (72-56 m.y.B.P.) rapid (13 cm/yr, 5 in./yr), east-northeast-directed NA-Farallon plate convergence created northwest to north-trending, southwest to east or west vergent overthrusting and west-northwest-trending sinistral faulting in the LF from southern Arizona to northern Montana. Extremely rapid (15 cm/yr, 6 in./yr), north-northeast-directed NA-Farallon plate convergence in the Eocene (56-43 m.y.B.P.) generated intense northwest-trending, southwest vergent overthrusting in southern Arizona, north-trending dextral faulting in the southern LF, and east-west-trending north to south vergent overthrusting in the northern LF.

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Dedolomitization, Dolomitization, and Chertification in Fort Payne Formation: Relative Timing and Mechanism

Samples of the Fort Payne Formation (Lower Mississippian) of central Tennessee typically contain 50% or more chert, with the bulk of the balance consisting of replacive dolomite. Low-iron calcite and ferroan calcite are common and minor ankerite is also present. The relative sequence of diagenetic replacement was established by cross-cutting relations as: low-iron calcite replaced by chert replaced by dolomite, introduction of ankerite, and finally, replacement by ferroan calcite of both chert and dolomite (dedolomitization). Thus dedolomitization was the last diagenetic phase. Complete replacement, rim replacement, and replacement of cores of dolomite rhombs by ferroan calcite was observed. Ferroan calcite fills veins, vugs, and intergranular pores and replaces sponge spicules. Dedolomite occurs in both surface and subsurface samples, and there is no evidence for an unconformity within or adjacent to the Fort Payne, suggesting that the dedolomite is not related to exhumation and weathering. Minor mineralogy and sedimentary structures suggest a subtidal shelf, quiet-water environment of deposition. Stratigraphic relations suggest shallow burial. Dedolomitization of the Fort Payne occurred after lithification, probably during shallow burial, when ferrous iron was derived from indigenous minerals.

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A Microcomputer-Based Borehole Engineering System

This paper describes a microcomputer system designed to take raw drilling data combined with measured rock properties such as porosity and permeability to produce output in the form of depth plots. User-selected parameters include porosity, permeability, formation pressures such as pore, fracture, or overburden, rock properties such as Poisson's ratio or bulk modules, and bottomhole and formation temperatures.

Data entry can be done via multiplexor from a data gathering system, through a data communication link, or by manual input. The system allows either raw or partially processed data to be supplied, and can be run either online in real time at the wellsite or offline at a remote location.

The data is processed sequentially by the system, with each calculation or processing module performing a specific operation on the data. The calculation modules used for any data set are selected by the user from a base menu. These modules can be removed, added or changed as desired by the client or operator, allowing easy tailoring and expansion of the system.

Output from the system goes to disk for storage and to a drum plotter. This enables continuous monitoring of the borehole parameters as the well is drilled, and enhances the value of the data.