gross discrepancies between seismic lines, faults, or suspected bad well data.

In addition to the basic surface manipulation tools, an interactive environment allows the system user to manipulate individual data items (add, delete, or alter well data, shift seismic data, etc), attempt different approaches, and play "what-if" games, until the most satisfactory set of results is obtained.

SHANNON, LEE T., Energy Reserves Group, Inc., Denver, CO

Stratigraphy of Blair Formation, an Upper Cretaceous Slope and Basin Deposit, Eastern Flank of the Rock Springs Uplift, Wyoming

The Blair Formation (Upper Cretaceous) is the lowermost unit of the Mesaverde Group in southwestern Wyoming. Outcrop study of the Blair exposures on the east flank of the Rock Springs uplift reveals 1,100 ft (330 m) of sandstone, siltstone, and shale. The formation has a sharp conformable to locally erosional basal contact and contains intraformational channeling, syndepositional slumping, and high-energy sedimentary structures. Facies relationships indicate the Blair represents a slope and basinal deposit laterally equivalent to the shelf and delta complex of the lower Rock Springs Formation to the north. Overall stratification types, textures, and southeast paleotransport directions recorded within the Blair, which are normal to the southwest-trending Rock Springs shoreline, support this interpretation.

High sedimentation rates in excess of subsidence rates during the early Campanian, possibly related to early movement on the Absaroka thrust and a eustatic lowering of sea level approximately 81 Ma, caused rapid shoreline progradation and favored the development of a narrow shelf. These conditions enabled sand-sized material to bypass the shelf and be deposited in slope and basin environments. A present-day example of these relationships is the modern Mississippi delta located near the shelf-slope break of the Gulf of Mexico.

Recognition of a narrow shelf in southwestern Wyoming during the early Campanian requires a modification of Late Cretaceous paleogeography to incorporate the concept of depositional topography. The occurrence of slope and basin sandstones in the Blair suggests that new interpretations may be needed to explain sandstone distribution for other stratigraphic intervals within the Cretaceous of the Western Interior.

SHEPARD, BETSY, Infinity Oil Co., Billings, MT

Three Ancient Montana Fluvial Systems: Pennsylvanian Tyler, Lower Cretaceous Muddy, and Upper Cretaceous Eagle—Their Reservoir and Source Rock Distribution

The importance of using Holocene geology as a model in mapping reservoir and source rock distribution is demonstrated in three Montana river-related systems: alluvial valley, barrier bar, and distributary channel-prodelta.

The Pennsylvanian Tyler Formation was deposited by a westward-flowing meandering-stream system controlled by an east-west-trending rift valley, and surrounded by backswamp deposits. It is underlain by its probable hydrocarbon source, the marine Mississippian Heath shale and limestone, and overlain locally by the lagoonal Pennsylvanian Bear Gulch Limestone. To date, about 90 million bbl of recoverable oil have been found in Tyler sands.

The oil-producing Lower Cretaceous Muddy sandstones in the northern Powder River basin are considered to be barrier bars, encased in organic-rich shales, which are most probably the source rock. The Upper Cretaceous Eagle Sandstone in north-central Montana is a distributary channel system, similar to that of the modern Mississippi, which dumped highly carbonaceous materials into an organic-rich delta system. The Eagle now contains possibly enormous amounts of biogenic methane.

By using Galveston Island and the modern Mississippi delta as models, in conjunction with employing electric log shapes and porosity logs, it is possible to map ancient fluvial patterns in the study areas. One can then predict the location of possible hydrocarbon accumulations in porous and permeable sand bodies, along with their encasing hydrocarbon source rocks.

SHEPARD, WARREN, and BETSY SHEPARD, Infinity Oil Co., Billings, MT

Tectonic History of Sweetgrass Arch, Montana and Alberta—Key to Finding New Hydrocarbons

The Sweetgrass arch of northwestern Montana and southern Alberta is a major ancient structural feature. Initial anticlinal emplacement occurred during the early Paleozoic and was parallel with the cratonic margin. Strong uplift followed by peneplanation occurred during the Late Jurassic and basal Cretaceous during the westward drifting of the North American plate following the breakup of Pangea. During Cretaceous and early Tertiary times, the Sweetgrass arch was quiescent, but was rejuvenated in mid to late Tertiary, upwarped by a basement flexure to its present structural configuration: a 200 mi (322 km) long, north-plunging anticline showing 10,000 ft (305 m) of structural relief. Midway down its plunge, the anticline is offset 30 mi (48 km) by a right-lateral transcurrent fault.

During Late Cretaceous and early Tertiary, plutonic uplifts were emplaced on the east flank, forming traps for oil then migrating updip from the Williston and Alberta basins. Oil and gas accumulated in Mississippian, Jurassic, and basal Cretaceous reservoirs in structural and stratigraphic traps around these plutonic uplifts. Subsequent late Tertiary doming of the Sweetgrass arch tilted the earlier structural traps and drained them, resulting in remigration of much of the oil and gas to the crest of the arch. The tilting failed to destroy many of the stratigraphic traps. As a result, down the flanks of the Sweetgrass arch are many "frozen" stratigraphic traps including Cut Bank field, the largest single-pay stratigraphic trap in the northern Rockies (164,000 bbl of oil, 0.5 tcf gas). On the crest are large structural accumulations of remigrated oil at Kevin Sunburst (81,000 bbl of oil) and Pondera (26,000 bbl of oil). Evidence of remigration is recorded by live oil show "tracks" in the reservoirs and remnant gas caps throughout the area of earlier accumulations. A potential exists for finding new "frozen" traps on the flanks and remigrated oil accumulations on or near the crest of the Sweetgrass arch.

SHIER, DANIEL E., Energy Data Services, Aurora, CO

Prospect Generation Using Digital Well Log Data—Minnelusa Formation

Trapping in the Permian Minnelusa Formation is almost entirely stratigraphic. Much of the oil is trapped in "buried hilltops" controlled by the unconformity at the top of the Minnelusa. Highly localized stratigraphic changes within the upper Minnelusa are also important.

The database used for computer mapping of the Minnelusa play includes cartographic data, formation and zone tops, and digital well log traces. Digital log data consist of sonic and gamma-ray curves from all but 300 of the 4,100 wells penetrating the Minnelusa Formation. Using this data base, exploration geologists have been able to make any needed type of regional stratigraphic map in a few days.

Many recent discoveries have been made on leads previously generated by computer maps.

SHURR, GEORGE W., St. Cloud State Univ., St. Cloud, MN, and U.S. Geol. Survey, Denver, CO, and DUDLEY D. RICE, U.S. Geol. Survey, Denver, CO

Paleotectonic Controls on Deposition of Niobrara Formation, Eagle Sandstone, and Equivalent Rocks (Upper Cretaceous), Montana and South Dakota

The deposition of the Niobrara Formation, Eagle Sandstone, and equivalent Upper Cretaceous rocks was controlled by paleotectonic activity on lineament-bound basement blocks in Montana and South Dakota. Linear features observed on Landsat images provide an interpretation of lineament geometry that is independent of stratigraphic data. Paleotectonism on lineament-bound blocks is documented in three areas that were located in distinctly different depositional environments.

In central Montana, coastal and inner-shelf sandstones and nonmarine coastal-plain and wave-dominated delta deposits reflect paleotectonic control by lineaments trending north-south, east-west, northwest, and northeast. In the northern Black Hills, chalks and outer-shelf sandstones