in porosity and permeability between the two rock types appear to be related solely to a unique set of diagenetic conditions. The two rock types can be defined by log analysis, hydrocarbon pore volume calculations, and permeability-thickness data.

TONNSEN, JOHN J., General Hydrocarbons, Inc., Billings, MT

Paleotectonic Influence of Precambrian Wyoming Province and Adjacent Terranes on Phanerozoic Sedimentation on Western Cratonic Shelf

The Archean Precambrian Wyoming province is bounded on the north and south by regionally extensive early Proterozoic mobile belts. Archean rocks have been remobilized by early Proterozoic tectonic events in the northern belt, but the southern belt does not appear to contain rocks as old as Archean. On the east, an early Proterozoic suture belt separates the province from the Archean Superior province. The western margin lies under the western Overthrust belt. The paleotectonic articulation among these anisotropic Precambrian lithostructural terranes, in response to cratonic and continental margin vertical and horizontal forces, influenced the distribution of many Phanerozoic stratigraphic facies. An analysis of the major unconformities in the stratigraphic record in light of the Precambrian lithostructural history of the western shelf discloses new observations concerning the petroleum source rock and reservoir rock stratigraphy of the northern Rocky Mountain region. A correlation between these tectonic terranes and the localization of regional hydrocarbon accumulations has been observed and has been useful in basin analyses for exploration.

VERVILLE, GEORGE J., D. D. DROWLEY, Amoco Production Co., Denver, CO, J. F. BAESEMANN, Amoco Production Co., Tulsa, OK, and S. L. JAMES,* Consultant, Denver, CO

Age Correlation and Tectonic Significance of Wildcat Peak Formation, Northern Toquima Range, Nevada

The Wildcat Peak Formation is exposed only in the northern part of the Toquima Range, Nye County, Nevada. It lies on western siliceous assemblage rocks (Ordovician Vinini Formation) and eastern carbonate assemblage rocks (Ordovician Pogonip Group and Silurian Roberts Mountains Formation), which were juxtaposed by thrusting during the Antler orogeny. The Wildcat Peak consists of three datable marine tongues separated by intervals of coarse clastic deposits. The coarse clastic intervals resulted from truncation following sporadic and cyclic uplifting that continued after the emplacement of the Roberts Mountains allochthon.

In the literature, age assignments for the formation range from Early Pennsylvanian (Atokan) to Early Permian (Wolfcampian). These age assignments are correct, but they only represent the middle and upper parts of the formation. Microfossil analysis has now established that the lower part of the Wildcat Peak is mid-Mississippian (Meramec). All microfossil dates are from material collected from transgressive limestones.

The new information indicates that major Antler thrusting ceased prior to mid-Mississippian time in the Toquima Range. This restricts the length of time of the Antler orogeny from Late Devonian to pre-middle Mississippian (Meramec) instead of Late Devonian to mid-Pennsylvanian. Such an interpretation is consistent with recently published data from the Pinyon Range area, Nevada.

VILLIEN, ALAIN,* Elf Aquitaine Petroleum, Denver, CO, and ROY KLIGFIELD,* Univ. Colorado, Boulder, CO

Thrusting and Synorogenic Sedimentation in Central Utah

The thrust belt in central Utah can be divided geometrically into four major thrust systems, from west to east: the Canyon Range, the Pavant, the Gunnison, and the Wasatch thrust systems, Biostratigraphic correlations together with constraints imposed by the geometry indicate the following ages for thrusting events: late Albian for the Pavant 1 thrust, late Santonian–early Campanian for the Pavant 2 thrust, middle to late Campanian for the late Canyon Range thrust, late Maestrichtian for the Gunnison thrust system, and late Paleocene for the Wasatch thrust system.

In the hinterland, a combination of structural, stratigraphic, and chronologic evidence indicates that shortening was accommodated by the development of a backbreaking (overstep) thrust sequence: Pavant 1 thrust, Pavant 2 thrust, (late) Canyon thrust. This led to the formation of successive overlapping unconformities of late Cenomanian, early-middle Campanian, and late Campanian age. In the foreland, the Gunnison thrust system has a ramp-flat geometry; a series of blind, splay, imbricate faults are associated with a major ramp beneath Sevier and Sanpete Valleys. Late Cretaceous and Paleocene unconformities coincide with the development of an imbricate fan, which was subsequently deformed during the late Paleocene by formation of a deeper duplex structure within the Wasatch thrust system. Associated back thrusts accommodated shortening toward the surface at the west side of the Wasatch Plateau.

The times of superimposed thrusting phases, when compared with eustatic episodes recorded in the Cretaceous seaway, indicate that episodes of continental tectonism were approximately synchronous with eustatic rises in central Utah.

WAECHTER, NOEL B., Consultant, Denver, CO., and WALTER E. JOHNSON, Exploration Geoconsultants, Inc., Denver, CO

Pennsylvanian-Permian Block Faulting in Subsurface of Piceance Basin, Colorado

Pennsylvanian-Permian age block faulting has been identified on two regional seismic lines in the Piceance basin. At the south end of a north-south line along the west side of the basin, the Mesozoic section unconformably overlies the Precambrian. Five miles (8 km) to the north, reflectors of the Mississippian Madison Limestone appear in a series of fault blocks downthrown to the north. These faults generally do not displace overlying Mesozoic rocks. In the vicinity of Douglas Creek field, this block faulting created a large horst block on which Madison Limestone is faulted step-wise up the flanks of the structure. The overlying Pennsylvanian Maroon Formation is 50% thinner over the crest of this structure than it is 10 mi (16 km) to the north. Similar features can be seen on a second seismic line running east-northeast through the central portion of the basin between DeBeque field and the Grand Hogback. Coming off the ancestral Uncompahgre highland, Madison reflectors appear near the southwest end of the line in a series of fault blocks downdropped to the northeast. Near Rulison field, a large Pennsylvanian-age horst block is present that may have Madison Limestone stripped from its crest. Near the Grand Hogback, Madison Limestone is faulted up to the east to form a Pennsylvanian-age basement high between the Piceance basin and the Eagle basin to the east.

WARNE, JOHN R., Consulting Geologist, Billings, MT

Oil and Gas Potential of Idaho Thrust Belt North of Snake River Plain

The thrust belt north of the Snake River plain in south-central Idaho has the elements necessary for major oil and gas accumulations: large traps, thick reservoir rocks, top seals, rich oil-source rocks, and in at least parts of the area, a favorable temperature history. Only drilling is lacking.

The Utah-Wyoming Sevier thrusting extended north of the Snake River plain into southwestern Montana and south-central Idaho. Styles of thrusting and resulting traps are similar to the Utah-Wyoming portion of the thrust belt. After thrusting, large listric normal faults formed northwesterly trending valleys that were filled with Tertiary sediments. Some companies are looking for traps in thrusted Paleozoic rocks; others are exploring the valleys looking for stratigraphically trapped oil generated from deeply buried Tertiary sediments.

Paleozoic strata thicken westward from a normal cratonic sequence consisting of about 5,000 ft (1,524 m) of chiefly carbonate rocks in the east to more than 30,000 ft (9,144 m) of sandstones, conglomerates, shales, and carbonates in the west. Of particular importance as a hydrocarbon source rock was the accumulation of about 3,000 ft (914 m) of organic-rich Mississippian McGowan Creek Shale in a starved basin between the Antler uplift on the west and the craton on the east. Outcrop samples of this shale contain from 0.8-6.3% total organic carbon.

Paleotemperatures in much of the area were too hot for preservation of oil according to alteration of conodonts. At least two important exceptions to the generally high paleotemperatures exist. The Tendoy thrust plate in the eastern part of the area has a conodont alteration index of 1,