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Stratigraphy, Petrography, and Paleoenvironmental Interpretation of Mississippian-Pennsylvanian Amsden Formation South of La Barge Guard Station, Salt River Range, Western Wyoming

The Amsden Formation, named by N. H. Darton in 1904 during mapping of the Bighorn Mountains, Wyoming, consists of red shales, limestones, sandstones, and cherty beds. The Amsden was later subdivided into four members (in ascending order): the Darwin Sandstone (E. Blackwelder, 1918), the Horseshoe Shale (W. W. Mallory, 1967), the Moffat Trail Limestone (W. J. Sando and others, 1975), and the Ranchester Limestone (W. W. Mallory, 1967). All members crop out in the study area.

The Darwin Sandstone Member is up to 88.4 m (290 ft) thick, disconformably overlies the Mississippian Mission Canyon Limestone, and is conformably overlain by the Horseshoe Shale Member. It is a quartzarenite with minor amounts of feldspar interpreted as being deposited in a nearshore or beach environment.

The Horseshoe Shale Member is 25.9 m (85 ft) thick and conformably overlies the Darwin Member. The Horseshoe Shale Member contains fine-grained terrigenous sediment interpreted to have accumulated in a lagoon or back-reef environment. The lower part is a white to red siltstone with localized areas of pisolitic hematite; the upper part is organic-rich black shale containing palynomorphs.

The Moffat Trail Limestone Member is 29.0 m (95 ft) thick and conformably overlies the Horseshoe Shale Member. The Moffat Trail consists of biomicrites, pelmicrites, and silty micrites. It is interpreted to represent open-marine, low-energy carbonate-shelf deposition.

The Ranchester Limestone Member is 9.4 m (31 ft) thick and conformably overlies the Moffat Trail Member. The Ranchester contains silty dolomite, carbonate, and red siltstone, representing the maximum transgression of the Pennsylvanian sea. The Pennsylvanian Wells Formation conformably overlies the Ranchester Member.

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Structural Control and Fractured Reservoirs in Relation to Oil Production from Green River Formation, Pleasant Valley–Monument Butte Fields, Uinta Basin, Utah

Current exploration activity in the northern portions of the Pleasant Valley-Monument Butte fields has been given great impetus by enhanced fracture permeability in what are generally low-permeability sandstone reservoirs. Associated with the Duchesne fault zone, these fractures trend both parallel to existing faults (approximately east-west), and oblique to structural trends (approximately northwest). Extensive coring has substantiated the existence of fractured reservoirs in both the green shale and black shale facies of the Green River Formation (Eocene), although some fracturing is probably compaction induced.

Gilsonite orientation can serve as a finger post to these fracture systems in that many gilsonite veins parallel fracture traces. Other gilsonites parallel apparent rollovers or open anticlinal features as expressed on the surface. These extremely gentle folds generally trend northeast and may also be a clue to increased production.

Finally, updip truncation of reservoir sandstones by high-angle faults represents another concept related to increased Green River recoveries. Some faulted sequences dip rather severely to the north (15°-30°) compared to the regional dip (2°-3°). These displaced strata may contain a known reservoir whose hydrocarbon contents are trapped against one of these east-west lineaments of the Duchesne fault zone.

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Geometry of Wind River Thrust, Wyoming

A thick wedge of Precambrian crystalline rocks of the Wind River Mountains was thrust far across sediments of the Green River basin during the Laramide orogeny. Dip of the thrust zone decreases with depth to form a broadly curved, convex-downward surface. Seismic data also show strong local curvatures that produce a scalloped pattern in the leading edge of the thrust wedge and divide the wedge into lobate segments that are about 8 mi (13 km) wide along strike. The explanation for this scalloped pattern of folding may be lengthening of the unconfined wedge margin by extension during thrusting. Curvature of the thrust surface confirms that deformation of Precambrian rocks occurred by a foldlike mechanism. Local curvatures can also explain low apparent-dip angles of some other thrust faults in the Wyoming foreland.

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Geology and Economics of Tar Sands

Petroleum in the form of tar sands may occur either as disseminated deposits or as veins or dike-like deposits. Disseminated occurrences may result from inspissation (drying up) of a preexisting pool of liquid and gaseous hydrocarbons into heavier residues with the loss of the lighter fractions leaving behind a fossil oil field. They also may originate as primary mixtures of rock and bitumen. However, such distinctions may seem farfetched compared to some of the largest known deposits in the world like the Athabasca tar sands of Alberta, Canada, which are of Cretaceous or Devonian origin and contain 100-300 billion bbl of oil.

Exploration and production of synthetic oil from tar sands were reported in many parts of the world, ranging from the Santa Maria field in California to sand asphalt deposits in Utah and around the Oklahoma Panhandle, to other fields in the United States, Canada, USSR, Venezuela, Trinidad, Cuba, and Germany. Experimentation, research, and mechanical design are the keys to commercial recovery of crude oil from tar sands (which are also a matter of supply and demand).

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Road Hollow Unit Gas Field, Utah-Wyoming Thrust Belt

The Road Hollow field, discovered in November 1981 in Lincoln County, Wyoming, is the northernmost field on the Absaroka plate producing trend of the Utah-Wyoming Overthrust belt. The discovery well, the Road Hollow Unit 4, gauged an initial potential of 10 MCFGD and 440 BCPD from the Ordovician Bighorn Dolomite. Chemical analysis of the gas indicates greater than 98% hydrocarbon gases with only 0.3% hydrogen sulfide.

The Road Hollow field is an anticlinal culmination formed during emplacement of the Absaroka plate. The structure is well defined by seismic data. In the discovery well, the Ordovician Bighorn Dolomite contains approximately 150 ft (45 m) of greater than 2.5% porosity, whereas dolomite in the Devonian Darby Formation contains about 10 ft (3 m) of greater than 2.5% porosity. Gas was recovered during a drill-stem test of the Darby, but the formation is not presently considered to be economical. Shales and anhydrites within the Darby Formation appear to form the vertical seal for the Bighorn trap. The source of hydrocarbons for the Road Hollow field is believed to be subthrust Cretaceous shales. Geochemical analysis of these shales indicates a good, mature source for oil and gas.

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Demarcation of a Duplex Zone: Rockport Lake Area, Utah

The structural relationship between the east-trending Uinta axis and the north-trending overthrust systems in Utah and southwestern Wyoming remains a major structural problem with important implications for regional tectonics and petroleum exploration. This relationship is apparent in the Rockport Lake area where a lateral to oblique ramp formed in the Absaroka thrust system and was folded about the Uinta axis. Three northeast-trending subparallel thrusts forming a duplex zone are exposed at the surface in the Rockport Lake area. From north to south, the thrusts place Kelvin Formation over Evanston Formation, Frontier Formation over Kelvin Formation, and Preuss formation over Frontier Formation, respectively. Ubiquitous stylolitic pressure solution cleavage in the hanging wall of the ramp shows major shortening from the west. South of the Weber River, in the foot wall of the ramp, the stylolitic cleavage is less common but still present.

Angular unconformities between the Frontier and Evanston Forma-