

Cretaceous reservoirs also may be the Paleocene lacustrine shale rather than the underlying Cretaceous marine shales and siltstones.

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STRATIGRAPHIC AND STRUCTURAL CONTROLS OF BITUMINOUS SANDSTONE DEPOSITS OF UTAH

The bituminous sandstones of Utah contain very significant reserves of oil which can add substantially to overall United States oil reserves. An understanding of the origin of the bitumen, the nature of the reservoir rock, and the mechanics of emplacement will lead to a more intelligent exploration program and to a more efficient development of the deposits. All of the bituminous sandstone deposits of commercial importance are located in the eastern half of the State of Utah. The largest of these is the Sunnyside deposit located in Carbon County. Next in order of importance are the deposits of the Asphalt Ridge area, the Whiterocks area, the Peor Springs deposits, and the bituminous sandstones of the Green River Desert. The reserves of these areas are much greater than previously estimated. The deposits in the Sunnyside—Peor Springs areas are stratigraphically controlled, occurring on a north-dipping monocline where the highly organic Green River Formation intertongues with the fluvial beds of the Wasatch Formation. Bitumen at Asphalt Ridge is contained in sandstone and conglomerate of the Eocene (?) Duchesne River Formation and in the basal sandstones of the Cretaceous Mesaverde Formation. In the former, bitumen beds saturation is related to unconformities and to faulting. In the latter, the saturation is related directly to progressive overlap and truncation, combined with structural folding. A Cretaceous source for the saturation in the basal Mesaverde beds is now proposed in view of new data rather than a Tertiary origin as interpreted previously. The accumulation of bitumen in the Navajo Sandstone of Jurassic age in the Whiterocks area, previously believed to have been primarily the result of stratigraphic controls and of Tertiary origin, is postulated to be of Paleozoic origin and the result, primarily, of strong structural control. The localization of bitumen in the Tertiary beds of the Chapita Wells—Dragon—Rainbow—Pariette Bench areas of the Uinta basin is related directly to good porosity and permeability within a reservoir associated with relatively strong structural controls, including both fracturing and faulting. It is proposed that the high pour-point, high wax crude oil of the Red Wash—Walker Hollow—Wonsits—Brennan Bottoms—River Junction—Pariette Bench—Monument Butte oil fields represents the original, "first-phase" oil. The "second-phase" oil is represented by original entrapped oil which escaped upward when faulting and subsequent fracturing of the reservoir took place. The oil moved into the porous and permeable sandstones cut by the frac-

tures and faults and, during erosion, the lighter fractions escaped. Because of the viscosity of the crude when the larger fracture systems opened, only a relatively small percentage of oil was able to move into the sandstone reservoirs. The greater volume was left in the fractures which remained open and, with more complete oxidation and subsequent induration, formed the many exotic hydrocarbons of the basin such as gilsonite, elaterite, wurtzilite, ozocerite, tabbeyite, and others. The difference in chemical composition is intimately associated with the source beds as stated in the literature; however, the mechanics of emplacement have heretofore never been explained adequately. The localization of bitumen in the Moenkopi, Kaibab, and the White Rim Formations of the Green River Desert area in central Utah is related directly both to structural and stratigraphic controls. Local entrapment of oil in post-Laramide structures was probably controlled by regional hydrodynamics, because a fairly well-defined asphalt-water contact is present. Furthermore, the best saturations occur on well-defined structural features. The origin of the oil undoubtedly was the Permian Kaibab Limestone or, where it is missing, the basal marine facies of the Moenkopi Formation. There are other areas of lesser importance where the relationship between the controlling parameters of structure and stratigraphy can be established.

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COMPREHENSIVE SURFACE MAPPING IN WILLISTON BASIN

The systematic surface structure-mapping procedure of the Montana part of the Williston basin is comprehensive and consists of three phases: planning, data-gathering, and integration. The final product is a morpho-tectonic map that combines the physiographic data of an area with the geologic data in a regionally consistent interpretation. Applied to the Williston basin, this comprehensive method has been successful in defining positive and negative trends within the tectonic framework of such well-known features as Cedar Creek anticline, Freedom dome, Weldon fault, and Blood Creek syncline. In the course of defining the local features, a tectonic theory was gradually evolved for the Williston basin suggesting that the local structural trends within the basin are the result of reactivation of a pre-existing set of basement zones of weakness oriented most commonly at approximately N. 45° E., N. 70° E., N. 45° E., and N. 75° W. Some areas display also a N. 20° W. trend. Paleozoic reactivation of the trends is suggested by geomorphic data and by subtle deflections in the trend of surface structures or by alignment of positive features to form culmination. The Laramide reactivation, concentrated along the north-west-oriented trends, dominates the present surface structure and appears to have been superimposed on the older structures.

15TH ANNUAL MEETING OF GULF COAST ASSOCIATION OF GEOLOGICAL SOCIETIES

Houston, Texas, October 27-30, 1965

The Fifteenth Annual Meeting of the Gulf Coast Association of Geological Societies and the Gulf Coast Section of the Society of Economic Paleontologists and Mineralogists will be held jointly with a Regional Meet-

ing of The American Association of Petroleum Geologists from October 27-30, 1965, in Houston, Texas. The convention hotel will be the Shamrock Hilton which will be the scene of the registration, technical