vember, 1962, at a depth of 1,240 ft. Cumulative production is more than 1,000,000 barrels and initial potentials have ranged up to 665 BOPD. Depth of the standstone ranges from 1,134 to 1,781 ft. and averages less than 1,500 ft. Dry-hole cost averages less than $5,500; completed wells cost $15,000–$20,000, and payout periods can be as short as 4 months. The productive sandstone ranges from 3 to 13 ft. in thickness, has a porosity of 9–24%, and a permeability of 1–872 md. Original bottom-hole pressure was 465 psi.

The producing body is an elongate, northwest-trending marine sandstone accumulation of Niobraran age. It is 25 mi. long and averages 0.5 mi. in width. The sandstone was deposited in erosional troughs formed on the Niobrara-Carlile unconformity. The unconformity rises toward the southwest across the basin. Usually sandstones are found in troughs formed by longshore currents or at the base and seaward edges of cliffs at the unconformity. Detailed isopach mapping shows irregularities along the trough.

Subsequent Laramide folding and faulting and post-Laramide erosion have caused a variety of fluid accumulations within the stratigraphic trap. Zones of fresh water, oil and brackish to salt water, oil, and gas caps occur at different positions along the trend of the sandstone. In Colorado the sandstone dips southeast for 12 mi., from an outcrop elevation of 5,400 ft. to a deep syncline at the Colorado-New Mexico boundary where the oil-water contact is at 3,900 ft. Southeast of the syncline, the sandstone rises 400 ft. in 2½ mi. onto the faulted asymmetrical Blue Hills anticlinal nose and finally descends gradually southeastward into the San Juan basin. A normal fault that divides the sandstone into separate reservoirs is located almost 1 mi. northwest of and essentially parallel with the axis of the plunging Blue Hills anticline. This fault causes the gas-oil contact to be 85 ft. higher on the upthrown (northwestern) side.

34. DONALD I. FOSTER, Consulting geologist, Evergreen, Colorado.

TRAPPING MECHANISMS OF SELECTED FIELDS, CHEROKEE RIDGE, WYOMING AND COLORADO

The Cherokee Ridge is a complex anticlinal arch separating the Washakie basin, Wyoming, from the Sand Wash basin on the south in Colorado. Several fields, primarily gas, are located on the Cherokee Ridge. Exploration has been based primarily on structural "plays" and has proved successful. With present control, it can be demonstrated that at least part of the fields are stratigraphic with only the area and size modified by the structural configuration.

The trapping mechanisms of several fields on the eastern and western ends of Cherokee Ridge are varied and provide templates to guide further exploration.

On the eastern Cherokee Ridge, traps for gas are formed by: (a) structural closure (South Baggs and West Side Canal fields); (b) closure against the downthrown side of a fault (Four Mile Creek field); and (c) porous Lewis and Mesaverde sandstones crossing the Cherokee Ridge (South Baggs and Pole Gulch fields).

On the western end of the Cherokee Ridge, gas accumulations are formed by: (a) structural closure (most fields in some degree); (b) truncation of reservoir sandstones in Lewis and Fox Hills across structural noses (West Hiawatha and Canyon Creek fields); (c) Almond sandstones (uppermost Mesaverde) developed on and across structures (Sugar Loaf, Canyon Creek, and Pioneer fields); and (d) facies change (with possible hydrodynamic reinforcement) in the Trail and Canyon Creek zones of the Mesaverde (Trail and Canyon Creek fields).

35. DONALD O. ASQUITH, Chevron Oil Company, Casper, Wyoming

MESAVERDE AND "ALMY" PRODUCTION, BIRCH CREEK UNIT SUBLETTE COUNTY, WYOMING

Birch Creek field is located on the LaBarge arch in the western Green River basin, and is a part of the Big Piney-LaBarge producing complex. Oil and gas are produced in this area from sediments ranging in age from Jurassic through Paleocene. Of concern here are the trap geometry and source of hydrocarbons of the shallower productive intervals within the Mesaverde and "Almy" Formations.

The Upper Cretaceous Mesaverde and upper Hilliard Formations together form a typical regressive sequence of, from northwest to southeast, lagoonal coal-bearing siltstone and thin sandstone, a littoral sandstone complex, and marine siltstone and shale. Uplift along the LaBarge arch during the Late Cretaceous or very early Paleocene resulted in the erosion of a portion of this sequence and an unknown thickness of Late Cretaceous rocks. A combination of the truncated edge of the upturned littoral sandstone complex in conjunction with lateral permeability changes and the gentle structure of the LaBarge arch forms the traps within the Mesaverde.

The Paleocene sequence, assigned to the "Almy" Formation by operators in the area, is composed of clastic sediments derived from two separate and distinct source areas. An upper sequence, consisting of conglomerate, varicolored shale, and siltstone, was derived from a sedimentary terrane probably in the rising thrust belt on the west. This sequence is characterized by pebbles and cobbles of limestone and quartzite and would be better assigned to the Chappo Member of the Wasatch Formation. The major (or lower) part of the Paleocene rocks at Birch Creek was derived from a granitic source on the east, probably in the vicinity of the Wind River Mountains, and is characterized by abundant mica and feldspar. The Paleocene forms a regressive lacustrine sequence of the following facies: (1) lacustrine shale; (2) marginal lacustrine sandstone; (3) paludal shale, siltstone, and thin sandstone; and (4) variegated mudstone and thick sandstone, probably deposited in a fluvial environment. A more logical formation assignment of this latter sequence would be to the Fort Union Formation.

Significant oil production and the major part of the gas production from the Paleocene at Birch Creek and surrounding fields are from reservoirs within the marginal lacustrine sandstone facies. Traps result from the updip and lateral pinchout of individual sandstones into lacustrine shale along the eastern flank and crest of the LaBarge arch. Structural modification of this basic trapping mechanism is present at some nearby fields such as LaBarge.

The close association of significant oil product and the greater portion of the gas production with the Paleocene lacustrine shale body strongly suggests that this shale is the source of the hydrocarbons produced from these reservoirs. The close association of production from the Mesaverde with the unconformity and the overlying shale body, the lack of a distinct difference between oils from Cretaceous and Paleocene reservoirs, and the lack of significant production from areas where shale is absent or poorly developed suggest that the source of hydrocarbons produced from these