The development of oil and gas reservoirs of the Cherokee sands in southeastern Kansas may be defined into two major periods. One may be considered that period of development prior to the utilization of hydraulic fracturing treatments, while the other represents that period influenced by artificial fracturing. The first period may also be subdivided into several phases. The first commercial well drilled in Kansas was in 1860 near Paola. The outbreak of the Civil War discouraged any further venture such as this, but drilling was resumed following the war and exploration spread all up and down the Verdigris and Neosho Valleys. A major impetus to the development of oil and gas in Kansas was provided by the discovery of the El Dorado pool in 1915 and the Augusta pool in 1916. A generally normal period of development followed with a slight decrease in activity to 1949. In the fall of 1950, the first artificial fracturing treatment was applied to the Cherokee sands in southeastern Kansas with excellent results. This started another near-boom and for the past 2 years the drilling activity has increased many-fold, resulting in many discoveries.

One area in which the hydraulic fracturing of reservoir rocks has produced excellent results is in the Gibson pool, T. 34 S., R. 3 E., Cowley County, Kansas. The name "Bartlesville" has been utilized to identify the producing beds in the Gibson pool to conform to common usage in this area. However, it is believed the sand should be considered Red Fork or Burbank in age and that no true Bartlesville sand is present in this part of Kansas. The discovery well of the Gibson pool is Texas Company's Bryant 1 "A," SE., SE., NW., Sec. 32, T. 34 S., R. 3 E. This well encountered a saturated sand superjacent to the Mississippian, but drill-stem testing of this zone recovered only a minor quantity of mud which was very slightly oil-cut. However, after pipe was set and the formation fractured, the Bryant 1 "A" was completed as a flowing well with a potential of 80 barrels of oil per day on March 3, 1952. Twenty-six new wells have been drilled within the new pool area and in many places the reservoir sand was found to be tight with low permeability and porosity conditions indicated by core analyses and drill-stem testing. However, fracturing treatment, both in the open hole and through casing, has resulted in obtaining some excellent wells, three of which have been given a maximum production rating.

ROCKY MOUNTAIN SECTION ANNUAL MEETING, CASPER, WYOMING, APRIL 23–24, 1953

ABSTRACTS

1. PAUL UMBACH, consulting geologist, Albuquerque and Denver, "Tectonics and Its Relation to Oil and Gas Production in the Four Corners Area of New Mexico, Colorado, Arizona, and Utah."

The type of sediments deposited as a result of geo-anticlines, geo-synclines, local embayments' and uplifts are of major importance.

Sediments indicate the intensity of the uplifts, some of which have been active since at least the Devonian period. Uplifts and embayments have caused varied sediments, ranging from coarse arkose near the uplifts to sandstones, shales, evaporites, and limestones. The mapping of the changes of sediments by isofacies and isopach maps is considered of utmost importance.

The large number of successful wildcat wells drilled for stratigraphic traps as a result of detailed study of the sediments, compared with the success of wildcat wells drilled on anticlinal structures without regard to the types of sediments in the Four Corners area, indicates that a study of the changes in the type of sediments is more important than the mapping of local anticlinal structures.

A study of the type of sediments and the location of anticlinal structures with the seismograph within the areas having sediments favorable for oil and gas reservoirs will be the key to future success in the drilling of wildcat prospects in the Four Corners area.

2. FOUR CORNERS GEOLOGICAL SOCIETY (Presented by SHERMAN A. WENGERD, University of New Mexico, Albuquerque), "Pre-Triassic Stratigraphy of the Four Corners Region."

The pre-Triassic strata of the Four Corners region are a hemi-cyclic complex of marine and non-marine facies resulting from complicated inter-reactions of broad uplifts from both outside and inside the region, localized uplifts and subsidences within the region, and major shifts of eugeosynclinal deposition within the Paleozoic Cordilleran geosyncline on the west.

The major stratigraphic divisions of the Four Corners region are thus four-fold as a direct result of a complex interplay of epeirogenic and orogenic activities within and surrounding the region. An outline summary of these divisions follows.

1. Widespread erosion of the pre-Cambrian complex during the Lipalian interval over the broad San Luis platform of which the San Loid, Defiance, Kaibab, Navajo, and Apache positive areas were only shelf components of the Cordilleran eugeosyncline. The San Luis platform is thus considered to be a broad region separating the Ouachita geosyncline on the east, the Sonoran geosyncline

on the south, and the Cordilleran geosyncline on the west during much of Paleozoic time. Subsequent to the widespread pre-Cambrian erosion, the San Luis platform oscillated downward episodically sufficiently to allow the deposition of Cambrian, Ordovician, Devonian, and Mississippian carbonate and sorted clastic strata as shelf sediments grading and thickening westward into basinal equivalents. A major positive oscillation resulted in the stripping-off of virtually all of the Ordovician shelf sediments during Silurian time.

2. Shelf conditions succeeded a widespread erosion interval during which the Molas shale was formed as a complex soil profile of early Pennsylvanian age. The earliest Pennsylvanian marine sediments thus are shelf carbonates which contain a vast pre-Des Moines intraformational disconformity that preceded the basination of the Paradox geosyncline.

3. Localized subsidence of a major part of the former widespread San Luis platform occurred to form the Paradox evaporite basin, which was a southeast-projecting arm of the Cordilleran geosyncline. Local shelves to the Paradox geosyncline, in which shelf carbonates and clastics were Kaiparowits basins. Marine access-ways to the Paradox basin existed on the northwest and on the southeast, with the San Rafael, Kaibab, Uncompahgre-San Luis-Nacimiento, and Zuni uplifts providing localized positive barriers tectonically accentuated during Pennsylvanian time.

4. Rapid rise of the Uncompahgre and Nacimiento uplifts caused coarse clastic arkosic sediments to be dumped into Hermosa seas from the northeast and east and Kaibab-Supai fine clastics from the south and west. Bodily uplift of the entire Four Corners region to continental conditions which existed from latest Pennsylvanian to latest Jurassic time.

3. Wm. Lee Stokes, University of Utah, Salt Lake City, Utah, "Western Margin of the Rocky Mountain Geosyncline in the Great Basin."

The concept of an inner (miogeosynclinal) belt and an outer (eugeosynclinal) belt in the Paleozoic of the Great Basin is useful in a broad general way. It is impossible, however, to draw a well marked dividing line between the two troughs not only for the Paleozoic as a whole but also for the individual systems. It seems certain that no sharp uplift or even linear group of uplifts ever separated the troughs and that it is fruitless to search for sharply defined edges for either trough.

The miogeosynclinal sediments are chiefly carbonates with minor shales and sandstones, the eugeosynclinal sediments are highly siliceous types such as chert, arkose, argillite, tuff, and black shale. Tongues of carbonate rock extend westward into the eugeosyncline, and, conversely, beds of black shale and chert are found in the miogeosyncline.

On the basis of aggregate lithologic aspect the western edge of the Rocky Mountain geosyncline has roughly the following course through the Great Basin: commencing near Burley, Idaho, thence to the northwestern corner of Utah, continuing successively through Wells, Cortez, Manhattan, and Goldfield, Nevada, and ending near Owens Lake, California.

Cover of Tertiary sediments and volcanic derivatives is thick and extensive over much of the eugeosyncline and unless deep wells are drilled there the exact nature of the older rocks may never be known.

4. J. Stewart Williams, Utah State Agricultural College, Logan, Utah, "Carboniferous and Permian Stratigraphy of the Oquirrh Basin, Northwestern Utah."

The Oquirrh basin, the dominant element in the late Paleozoic history of northwestern Utah and adjacent areas, first developed near the eastern margin of the Cordilleran miogeosyncline in medial Mississippian time. From then until the medial Permian, it existed continuously with alternate times of extension and contraction, the extensions being generally northwestward toward central Idaho and southwestward toward northeastern Nevada. Times of increased tectonism, which appear to be represented in accentuation of subsidiary basins and rise of marginal positive areas, with attendant contraction of the sea, were Meramecian and early Chesterian, Morrowan-Lampasan, Missourian-Virgilian, and early Wolfcampian. Times of decreased tectonism with less rapid depression and wider spreading of the marine waters were Desmoinesian and Leonardian-early Guadalupian. Particularly noteworthy are the Logan-Milligen sub-basin of early Chesterian time, the main basin in Wolfcampian time, and the Diamond Creek and Lower Park City sub-basins of late Wolfcampian and early Leonardian time. In the latter, dolomite, red and buff sandstone, and anhydrite were deposited to notable thicknesses.

The eastern margin of the Oquirrh basin was exceptionally abrupt and the remarkable change of facies exhibited there is accentuated by overthrusting which has moved the basin facies tens of miles eastward on to the shelf facies.

5. E. C. Reed, Nebraska Geological Survey, Lincoln, Nebraska, "Present Knowledge of Paleozoic Geologic History of the Denver Basin and Adjacent Parts of Western Nebraska and Northwestern Kansas."

The general lithologic character of the Paleozoic rocks of the Northern Mid-Continent region