Arbuckle Mountains, but the upper third is represented by shales and a thin sandstone of the Rhoda Creek formation. The succeeding Union Valley formation is correlative with the Primrose formation of the Ardmore basin, an equivalent of the Hale of Arkansas.

C. B. BRANAN, Kirkpatrick Oil Co., Oklahoma City
Geology of Oklahoma Part of Anadarko Basin

Isopachous studies of formation intervals within the Permo-Pennsylvanian systems of the Anadarko basin reveal marked change in depositional strike of the beds, thus indicating a progressive shift in axis of sedimentation in the basin.

The purpose of this paper is to direct attention to this condition and to indicate its importance in helping to solve many of the structural and stratigraphic problems in the Anadarko basin.

Variable rates of subsidence in the basin as reflected by ratios of thickening of individual units are shown by regional convergence studies of the area. Structural features are also revealed by this convergence mapping.

The change in axis of sedimentation in the Anadarko basin was of a gradual nature and conforms with no individual system, series or group boundary. Since these boundaries commonly lose their identity over broad areas, it becomes more convenient to map intervals between easily identified markers within the section in order to get an accurate over-all view of sedimentary conditions in the basin.

Positive correlation of beds in the Upper Mississippian (Chester) and the Lower Pennsylvanian (Atoka-Morrow-Springer) with their equivalents on the outcrop, and the placing of unconformable relationships within this section, remain unsolved problems in the Anadarko basin. This is due primarily to lack of well control in the depths of the basin. The author has inferred a set of correlations for this section from this study. A review is given of the various arguments and correlations concerning this all-important interval, pointing out the strong points and incongruities in each.

GEORGE DOBERVICH, Independent Geologist, Amarillo, Texas
Structural and Stratigraphic Relationship of Permian and Pennsylvanian Rocks of the Oklahoma Panhandle

Permo-Pennsylvanian sedimentation in the Oklahoma Panhandle has been primarily influenced, or controlled, by the Sierra Grande uplift, the Hugoton embayment, and the Anadarko basin. Sedimentary facies changes, because of these controlling features, grade from continental and near-shore deposits in western Cimarron County to shelf carbonates in Texas and Beaver counties, and finally to basinal sediments in southeast Beaver County.

Permo-Pennsylvanian deposition began with Morrowan shales and erratic sands upon an eroded Mississippian surface and continued almost without interruption throughout the system up into Wolfcampian time.

Division of the Permo-Pennsylvanian can be made on the basis of correlation from southwestern Kansas, since these units can be traced without great difficulty from this region.

Stratigraphic possibilities for oil and gas accumulation are favorable and appear to far outweigh the structural possibilities.

DANIEL A. BUSCH, consultant, Tulsa, Oklahoma
Comparative Study of Lenticular Reservoir Sands

Lenticular reservoir sands, when studied in the light of their depositional environment, shed considerable light on their nature and distribution. Lower Pennsylvanian sands of the Oklahoma part of the McAlester-Arkansas Valley Coal basin are lenticular in character and occur on the fringing shelf areas of the embayment. Successive epochs of Early Pennsylvanian subsidence are characterized by the deposition of lenticular sands, principally of the deltaic type. Examples of deltaic lenticular sands are known to occur in the Booch, Bartlesville, and Prue sandstone formations. Depositional environments are reconstructed by means of drawing isopachs of the genetic stratigraphic intervals in which these sands occur. Such maps serve to negate any significance of present structure and reveal the (1) shoreline trends, (2) distribution of shelf areas, and (3) the principal direction from which the sediments were derived. Additional maps of the individual reservoir sands, such as structure, thickness, isopotential, and reciprocal isopachs, reveal the nature of the lenticular sands within the genetic units. A knowledge of the origin and distribution of such sand bodies, both ancient and recent, is considered essential to the discovery of new stratigraphic traps of this type and to their exploitation once they are discovered.

GERALD C. MADDOX, Carter Oil Co., Oklahoma City, Oklahoma
Subsurface Geologic Cross Section from Logan County to Tulsa County, Oklahoma

Geologists should reach a general agreement on stratigraphic nomenclature in central-northern Oklahoma. The confusion which has resulted from erroneous correlations and misuse of formation names has retarded the progress of subsurface work. The correct use of the old names is all that is

necessary to eliminate this confusion. As an example, the name Cottage Grove is recommended for the section of erratic sandstones variously called "Layton," "Upper Layton," "Osage Layton," "Layton of Ponca City," "Peoples," and "Mussellem"; however, the name Layton should be retained for the sandstone below the Hogshooter.

The most conspicuous aspect of the stratigraphy is the near parallelism of all of the beds, except the erratic sandstones and limestones, in the marine Permian and Pennsylvanian. Local disconformities probably occur in this part of the section, but there are no major angular unconformities, even between series and systems. The two major unconformities shown on the cross section are at the base of the Pennsylvanian and at the base of the Woodford or the Misener.

WARREN BEEBE, Keating Drilling Co., Oklahoma City, Oklahoma
Geology of Northwestern Anadarko Basin

This paper reports the results of several years concentrated study of the northwestern Anadarko basin. Work commenced high on the southwestern flank of the Central Kansas uplift. Although the stratigraphic section of the Lower Pennsylvanian, Mississippian, and Upper Ordovician rocks is not complete in that area, rock units are easily recognized, well defined, and general agreement exists for their precise age and correlation.

Numerous problems, particularly in the Pennsylvanian and Lower Permian, are involved in correlating into the basin, determining age of sediments, and deciphering structural and depositional history. Abrupt facies changes near regional structural features and marked basinward divergence accentuate these difficulties. Series problems are encountered in recognizing, defining, and establishing the boundaries between stages. This is particularly true of the age of the sedimentary sequence subjacent to recognizable Des Moinesian, including strata variously called "Atokan," "Morrowan," "Derryan," "Lampassan," and possibly "Springeran," The boundaries between the Missourian and overlying Virgilian, and the Virgilian and superjacent Permian Wolfcampian, are also confusing. The structural and depositional history inferred in the area is dependent to a large degree on the definition of these stages. Introduction of names or terms, many local in usage, from various parts of the central United States adds to the confusion.

Regional subsidence into the Pennsylvanian Anadarko basin, the later Permian basin of West Texas, and subsequent pronounced tilting into the Mesozoic Denver basin, coupled with at least two major unconformities, numerous less important regional and local unconformities, disconformities, and hiatuses, further complicate the geology of the region.

Structural maps on several readily identifiable markers over most of the basin disclose its present structural configuration. However, the structural and depositional history is best revealed by a series of isopachous maps of the Mississippian, stages of the Pennsylvanian, and Lower Permian. Regional downwarping into the Anadarko basin continued from late Mississippian through the Pennsylvanian into Lower Permian.

Four general but distinct regional structural forms controlled deposition, including the central Kansas uplift and the Souixan landmass characterized by deposits of primarily carbonate rocks; a shelf area with rapid transition from carbonates to clastics along its edges; a deep basin area with finer clastics; and finally high areas such as the Apishapa-Sierra Grande features yielding coarse clastics and washes during much of the time. Reefoid deposits are present along the shelf edges and around major positive elements. Early and Middle Pennsylvanian sediments progressively onlapped onto truncated pre-Pennsylvanian rocks on the flanks of positive tectonic features. Younger Pennsylvanian sediments progressively overlapped those previously deposited as the basin area expanded. These conditions afford the widest variety of traps for accumulations of oil and/or gas. Production has been established in various types of stratigraphic and permeability traps, including biostromes, and structural traps in sandstones and limestones, including Wolfcampian, all Pennsylvanian stages, Chesterian, Meramecian, and Ordovician. No firm conclusions can be reached presently regarding precise age, correlation, and boundaries of many stratigraphic units. The writer deplores confusion resulting from introduction of local terminology from other areas, and urges restricting terminology to that of classic Pennsylvanian stages until more precise terminology can be justified. Cooperation of local geological societies can define and solve many of the stratigraphic problems.

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ABSTRACTS

JOHN W. MERRITT, consultant, Tulsa, Oklahoma
Radiation Surveying for Oil and Gas

For many years geologists and chemists have been aware of the presence of certain significant density patterns developed by analyzing surface soils over oil and gas reservoirs. Geochemists have