great that the Reagan sandstone of Cambrian age was locally exposed, from which it can be deduced that 11,000 feet of pre-Pennsylvanian rocks and probably at least 5,000 feet of Pennsylvanian strata had been stripped away.

The orogenic product derived from this deformation was the Collings Ranch conglomerate, a massive limestone boulder deposit which has an exposed thickness of 2,000 feet and a probable initial thickness of 3,000 feet. From the character of the rocks comprising the conglomerate, it is certain that the source areas were the Arbuckle and Tishomingo anticlines.

A slightly later surge of orogeny continued and even intensified the deformation. Block faulting, accompanied by some folding, broke the folded complex along previously established structural lines into grabens and horsts elevating the anticlines to greater heights and permitting the exposure, after erosion, of large granite areas in the Tishomingo and Belton anticlines. The Collings Ranch conglomerate was mostly eroded except where preserved in grabens, and the new orogenic deposit, the Vanoss conglomerate of latest Pennsylvanian age, was spread as a feldspar-rich blanket on the strongly folded and eroded edges of the older rocks. This younger conglomerate has a maximum thickness of 650 feet on the western edge of the Mill Creek syncline, nearest the Arbuckle and Tishomingo anticlines. At a few places the lower part of the Vanoss conglomerate is faulted and slightly folded by a final weak pulse, but the overlying younger rocks, including the Hart limestone which is considered to be the base of the Permian system, are virtually flat and mark the close of the Arbuckle orogeny in this region.

One of the major problems in Arbuckle Mountain structural interpretation concerns the nature of the northwest-trending through-going faults, principally the Washita Valley fault, Reagan fault, and the Sulphur fault zone. These have been variously interpreted as normal, thrust, scissor, and rift faults. Dips observed or inferred on the outcrop, together with information from drill holes, indicate that these faults locally have normal and locally thrust relations, and the conclusion is reached that both the Washita Valley and Reagan faults have a component of strike-slip movement. The Tishomingo anticline is believed to have moved northwestward between these two faults, probably as a result of stress transmitted from the Ouachita Mountains.

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Continuous Dipmeter, New Geological Tool

One of the newest tools of the exploration and exploitation geologists is the continuous dipmeter which was introduced to the industry in 1952. This paper describes the basic instruments and outlines some of the methods of calculation of dip and strike from data acquired by the instruments. The accuracy of the graphical method of calculating is plus-minus $\frac{1}{2}°$ of dip and plus-minus 1° of strike. This is not the over-all accuracy of the dipmeter, but merely the accuracy of the calculations. The over-all accuracy is influenced most by stratigraphy and micro-structure which are uncontrollable in the calculation procedure.

Several examples of continuous dipmeter surveys are given, with examples of the pitfalls in working dipmeters. A plea is made for competent company personnel to interpret the logs rather than leaning so heavily upon service-company personnel.

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Stratigraphic Study of Palo Duro Basin, Texas Panhandle

It was recognized as a basin in 1926 by Charles N. Gould who gave it its present name. Exploration and drilling have been slow and sporadic since that time, the present deep-well saturation being less than one test per 150 square miles. At present, there are one small gas field and one oil field within its limits; around its margins eight other oil pools are producing, of which the Anton-Irish is the largest.

It is bounded on the north by the Amarillo Mountains and their westward continuance, the Bravo dome; on the west by the New Mexico Highlands; and on the south by the Matador line of basement peaks. Having approximately 1,000 feet of general closure along its deepest axis, it opens eastward into the Hollis-Hardeman basin, and southward into the Midland basin.

Structure within its limits is complex with sharp folding accompanied by high-angle faulting trending primarily northwest-southeast. Subordinate to this prominent trend, a low-relief countertrending system of folding is becoming more apparent with latest control.

The basin probably had its inception near the beginning of Pennsylvanian time when the surrounding regional structural components had their initial movement. Structural movement along these axes has continued through the most recent deposits in the area. Movement along the buried Amarillo Mountains was noted as recently as three years ago when the last tremor emanating from the area was felt.

Historically, the area was an embayment of the major Permian-Pennsylvanian sea on the south and east. Sediments in this interval are closely akin to their counterparts in the surrounding area. Lower Permian and Pennsylvanian shales, carbonates, and sands appear identical with the same deposits in the surrounding basins. The great carbonate development of this interval extends into the area from the south and east and is of comparable magnitude. Within the clastic part of the basin the few wells penetrating this section have encountered well developed local sand and arkose deposits. The facies relationships here are the same as those in the Midland basin, with carbonate deposits averaging 800–1,200 feet thick and clastics ranging from 2,000 to 3,000 feet.

Pre-Pennsylvanian stratigraphy for the basinal area is comparatively simple. There is a basal sand of possible Cambrian age locally developed on the pre-Cambrian basement surface. In southeast Swisher County in the heart of the basin it reaches a thickness in excess of 200 feet. Here, it is a fine to coarse, porous sand, glauconitic in part. Above this the Ellenburger dolomite extends into the area from the east and southwest but is missing due to either erosion or non-deposition over the wide central part of the area along the axis of John E. Adam's "Texas Peninsula." From this Ellenburger remnant to Mississippian time there are no deposits present. The Mississippian consists of approximately 600 feet of carbonates near the south limits of the basin, thinning as it approaches an erosional edge along the south margin of the Amarillo Mountain structure. The relationship of the Osage, Meramec, and Chester shows that these rocks were eroded by early Pennsylvanian orogeny.

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Pennsylvanian of McAlester Basin, and Its Platform

The McAlester basin was a geosynclinal trough through the Atokan and Desmoinesian epochs. Later history is obscure and the trough seems not to have been geosynclinal. There was a narrow platform area in the Atokan, a moderate one in early Desmoinesian, and an extremely broad and stable platform during the remainder of Desmoinesian time. A few of the outstanding characteristics are the following.

Atoka basinal sediments are shallow-water, fine-grained clastics, with little preserved fossil life, virtually no coal, and rapid changes in grain size and thickness.

Atoka platform sediments are rich in carbonates, occur in a belt less than 100 miles wide, and reach maximum thickness of 350 feet.

Des Moines basinal sediments were deposited in swamps and in shallow marine water. Unlike those of some basinal sequences, the units have great continuity and relatively small lateral change in thickness and grain size.

Des Moines platform sediments are cyclical and have remarkable continuity of units, excepting most sandstones. Many of the coal beds and such thin units as the Doneley limestone, Tiawah limestone, and Verdigris limestone can be traced over much of the platform and some can be recognized far into the basinal area.

During the Upper Pennsylvanian the basin was only weakly geosynclinal, and its history is that of a dying paleogeographic element.

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Regional Stratigraphy and History of Ouachita Mountain Area

C. W. Tomlinson and the writer began a cooperative study of the Stanley-Jackfork-Johns Valley-Atoka stratigraphic sequence in the Ouachita province of southeastern Oklahoma in June, 1953. Although the work is still in progress, it is advanced enough to permit some conclusions.

Several members of the Stanley-Jackfork succession, which Harlton differentiated and named in Wildhorse Mountain and Prairie Mountain in the western Ouachitas, persist as far east as the Arkansas-Oklahoma line. Their recognition on the outcrop and on air photographs has made possible the differentiation of a large area of Atoka, and perhaps younger rocks, in a belt in the Kiamichi Range which has been mapped as Jackfork on the recent Oklahoma geologic map. Two unfaulted stratigraphic sections, showing the upper Stanley, a complete Jackfork sequence, and several thousand feet of overlying Atoka, have been discovered in the Kiamichi Range and have been described in detail. The Jackfork sandstone totals only 5,600 feet in the Kiamichi Range, which is considerably less than thicknesses ordinarily assigned to it. Work in the western Ouachitas has revealed that the lower part of the type Prairie Mountain formation, including the Prairie Hollow maroon shale, is equivalent to the upper part of the underlying Wildhorse Mountain formation at the type locality, and recognition of this duplication also reduces considerably the thickness assigned to the Jackfork in the western Ouachitas.

Several new occurrences of boulder-bearing Johns Valley shale are noted. In each outcrop the Johns Valley lies above a fossiliferous sandstone formerly included in the Jackfork, but correlated by Harlton with the Union Valley sandstone of the Arbuckle facies, and below another fossiliferous sandstone which was mapped as basal Atoka by Hendricks but which was correlated with the Barnett Hill by Harlton (Harlton regards the Barnett Hill as a split from the upper part of the Wapanucka or older reports). The boulder beds occupy persistent stratigraphic horizons within the Johns Valley and, whereas they contain numerous boulders foreign to the Ouachita province, they are indigeneous