ridges are prominent at Cape Henry, Virginia, Bogue Island, Parramore Island, and elsewhere on the Atlantic Coast and at many places on the Gulf Coast.

Beach sands on modern coasts are well sorted within individual beds or laminae. On the other hand, there is considerable range in grain size from laminae to laminae. The beach sands are composed chiefly of grains of quartz but contain minor amounts of a great variety of minerals.

Beach sands on modern coasts are transitory features that are modified by every storm. It is truly remarkable that many similar sand bodies of the geologic past have been so perfectly preserved in the geologic column. A few examples include the so-called shoestring oil sands in the Cherokee shale of Pennsylvanian age in Kansas and Oklahoma. These sand bodies have many features of the modern coastal sands. The length of one system of these sands is 150 miles. Some of the sand bodies in the Cretaceous system in the Denver basin of Colorado and Nebraska, and in the Powder River basin of Wyoming and the somewhat younger Cretaceous sands in the San Juan basin in New Mexico appear to have had a similar origin.

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Facies Changes in Pennsylvanian Rocks along North Flank of Wichita Mountains

The area of investigation in southwestern Oklahoma extends from Cement field, Tps. 5–6 N., Rs. 9–10 W., northwestward along the north flank of the Wichita Mountains to the Oklahoma-Texas boundary. A study of Pennsylvanian sediments in this area reveals conspicuous facies changes both laterally and normal to the mountain flank. In the lateral facies changes show a close relationship to the provenance from which the sediments were derived. Correlation difficulties are increased because of these facies changes. Fusulinids provide reliable age determinations when present. The Pennsylvanian rocks are dominantly clastics. The principal facies near the mountain front is "granite wash," a coarse clastic sediment composed primarily of igneous rock fragments with variable amounts of detrital carbonates and chert. Subordinate facies are arkosic sandstones, arenaceous, silty shales and thin, argillaceous limestones. These continental and transitional facies interfinger basinward with normal marine sandstones, shales, and limestones.

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Facies Patterns and Oil Accumulation in Pennsylvanian of Southern Oklahoma

Analysis of the complex facies patterns expressed by Pennsylvanian strata of southern Oklahoma requires identification of regionally extensive, correlatable, stratigraphic units. The writers have been able to extend a correlation network based on recognition of cyclical units which can be grouped into major operational mapping units separated by regional unconformities. The resulting stratigraphic subdivisions, both major and minor, are not those of the formal stratigraphic nomenclature accepted in the area but they do make possible a classification of trapping conditions related to position in the stratigraphic succession. The types are as follows: (1) blanket sands in which facies trapping components are markedly subordinate to structure; (2) discontinuous sand bodies with traps largely independent of structural axes; differentiation can be made between major sand bodies of greater areal extent than the associated structures, and minor sand bodies significantly smaller than the areas of the structures on which they lie; (3) traps related to unconformities, including channel fills, overlapping strand-line sands associated with marine transgression across major structures, truncation traps sealed by overlying permeability barriers, and secondary accumulations in permeable strata overlying truncated reservoirs; (4) sandstone reservoirs with apparent random distribution and without discernible relationships to facies patterns.

Relationships of the trap types enumerated can be demonstrated in terms of position in the stratigraphic succession, time and geography of structural growth, development and character of major unconformities, and other elements of the regional geologic history.

The regional study raises a number of questions which are not easily resolved but certain tentative conclusions can be drawn from analysis of regional and local facies patterns. Such questions include: (1) vertical homogeneity of areas either rich or poor in number and thickness of sand bodies; (2) relationship of limestone conglomerate to reservoir and sealing components; (3) diagenetic introduction of carbonate cement in relationship to time of oil accumulation; (4) volumetric proportions of sand and marine shale requisite to significant oil accumulation.

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Oil and Gas Possibilities in Central Nebraska Basin

The Central Nebraska basin comprises an area of more than 25,000 square miles bounded on the west by the Chadron-Cambridge arch, on the east by the Table Rock-Nehawka-Richfield arch, on the north by the Sioux uplift, and on the south by the Kansas-Nebraska line. For all practical purposes this basin is a northern extension of the Salina basin of Kansas. The area is extensively mantled with variable thicknesses of Cenozoic rocks resting on Cretaceous, Permian, and Pennsylvanian. The Pennsylvanian rests on Precambrian at the margins of the basin but within the basin variable thicknesses of pre-Pennsylvanian sedimentary rocks are known to occur in thicknesses varying from small amounts up to more than 1,000 feet. Basement rocks are reached in the basin at depths of about 4,500 feet or less. The number of significant tests drilled in this basin to date is comparatively small and is certainly inadequate to disprove this large area. The only oil production in this basin to date is in the southwestern part where some Pennsylvanian production has been developed. Adequate reservoir rocks are known to be present in the pre-Pennsylvanian sediments in many parts of the basin. Ground-water mineralization in the pre-Pennsylvanian sedimentary rocks is generally low but this condition is not believed to be completely unfavorable so far as the possibility of commercial accumulation of petroleum is concerned. The complex geologic history of the region presents some interesting possibilities for the accumulation of oil or gas in commercial amounts.

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Geology of McAlester-Arkansas Coal Basin

The McAlester-Arkansas Coal basin is an elongate arcuate basin in southeastern Oklahoma and northwestern Arkansas. It is bounded by the following: Mississippi embayment on the east, Ozark uplift on the north, Ouachita Mountains on the south, and Arbuckle Mountains on the west.

The stratigraphic sequence ranges from Cambrian through Pennsylvanian age with aggregate thicknesses of 2,000 feet of sediment along the northern rim of the basin to probably in excess of 25,000 feet in the southern part of the area. Paleozoic rocks of late Pennsylvanian age crop out over most of the area. The depositional axis has not been determined by drilling as yet. Geophysical methods may define the basin and clarify the relationship between the Arbuckle-Ozark type rocks and the Ouachita rocks.

Surface structures generally strike east-west and were formed by compressional forces from the south (Ouachita area) against the Ozark positive area on the north beginning in early Pennsylvanian time, and extending into the late Pennsylvanian. The effect of these forces is reflected by the amount of structural relief present; highly faulted structures occur south of the Choctaw fault, well defined structures north of the Choctaw fault, and gentler folds along the Arkansas River.

The basin has been the scene of exploratory work for many years with the greatest and best organized effort being carried out presently. Surface, subsurface, aerial photo interpretation, and geophysical mapping methods have been attempted. Monotonous sequences of sands and shales crop out, making surface work difficult. Rough terrane, poor accessibility, and hard drilling make seismic work expensive. Subsurface work will become increasingly important as more deep wells are drilled.

Gas prospects in Atoka and Morrow rocks are numerous, but a great volume of sediments both Pennsylvanian and pre-Pennsylvanian in age have not been evaluated.

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Interpretation of Ouachita Mountains of Oklahoma as Autochthonous Folded Belt

The Ouachita Mountains of Oklahoma are considered by many as a classical example of large scale, flat overthrusting, and are envisaged as a huge, floating, allochthonous body with a root somewhere farther south.

During extensive geologic mapping between June, 1953, and January, 1956, the authors failed to find large, flat overthrusts in the Ouachita Mountains. On the contrary, the stratigraphic and structural evidence indicates that the mountains are an autochthonous folded system.

The Potato Hills anticlinorium, where the idea of overthrusting was conceived, was mapped in detail. This anticlinorium consists of closely spaced, steep, partly overturned folds. The overturning is both toward the north and, against the supposed overthrusting, toward the south. Some anticlinal limbs have ruptured and steep reverse faults have developed, some of which yield north, others south. All of these faults die along strike, generally in the steep limbs of anticlines.

In the eastern Potato Hills there is the Round Prairie synclinorium which is bounded on opposite sides by faulted, overturned anticlines which face each other. Round Prairie is part of what has been described as a window in a major overthrust. However, the "window" is non-existent. The two border faults are separate, distinct, and die toward the west in unbroken folds. At the eastern end of the "window" the southern fault truncates the northern.

The Choctaw anticlinorium is also autochthonous, as originally determined by Honess (1923). Southward overturning predominates, and slaty cleavage has developed which mostly dips steeply north. This confirms predominant southward yielding and is incompatible with the concept of a great thrust sheet which has moved north.

In the core of the Choctaw anticlinorium the style of deformation changes: steep folds disappear and the cleavage becomes gently inclined. The change is gradual, stratigraphic and structural continuity being maintained. There is no overthrust break and there is no window. This change in structural style with increasing stratigraphic and structural depth suggests that a basal zone of disharmonic shearing-off is approached.