

Atokan rocks of the basin (Fig. 5) are thick (6 to 12 thousand feet) and are predominantly dark shales with tongues and lenses of sandstone. The group thins rapidly northward and is largely made up of clastic carbonates where it is less than 300 feet thick.

Desmoinesian rocks of the basin are 10 times as thick as the equivalent rocks of the platform. They are shales with some coal beds, thick sandstone tongues, and a few thin limestones. On the platform the section is markedly cyclical and 22 coal beds, 14 limestones, several tonguing sandstones lie in a predominantly shale section.

The basin was no longer geosynclinal after Desmoinesian time. Missourian and Virgilian rocks of the basin are no thicker than those of the platform, but are clastic and in large part are red or reddish. The base of the Missourian is everywhere unconformable upon older rocks. On the platform Upper Pennsylvanian strata are predominantly shale with many prominent limestone beds.

The Pennsylvanian-Permian contact is not marked by a definite lithologic break as usually selected. The top of the Brownville limestone is chosen by most because it is the first marker below the *Schwagerina*-*Pseudoschwagerina* zone. Russian geologists, who are studying the type area, are more and more inclined to place the boundary above the *Schwagerina* zone. If such a contact is finally accepted, the Midcontinent base of Permian will be the base of the Wellington, essentially equivalent to the base of the redbeds. Sample runners would certainly welcome such an easy pick.

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## STRATIGRAPHIC STUDY OF PENNSYLVANIAN AND PERMIAN ROCKS IN THE WESTERN MID-CONTINENT

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In the western Mid-Continent the typical post-Cherokee (lower Des Moines) Pennsylvanian, and pre-Leonard Permian, sediments consist of limestone formations on the shelf area and dark shales in the Anadarko basin; shelf-to-basin facies changes are abrupt.

These deposits are considered the product of a tectonically controlled marine advance from the Ardmore-Anadarko basin foredeep, and retreat toward the west Texas region. During the transgressive phase the Anadarko basin subsided and expanded. Consequently, Morrow, Atoka-Des Moines, and Missouri sediments overlapped the shelf area; Marmaton and Missouri shelf-limestone to basin-shale facies changes were located progressively shelfward; and the Cottage Grove, Tonkawa, and Lovell blanket sandstones in the Anadarko basin successively increased in areal extent. During the regressive phase the Anadarko basin gradually ceased to subside, diminished in areal extent, and became an embayment of the Permian basin to the southwest; as a result, Virgil and Wolfcamp shelf-limestone to basin-shale facies changes were located progressively basinward; the Elgin and Laverty sandstones in the Anadarko basin decreased successively in areal extent, and semi-continental clastics and evaporites were deposited over the western Mid-Continent as the sea withdrew toward the southwest.