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PATTERNS OF FLYSCH DEPOSITION OF LOWER STANLEY GROUP (MISSISSIPPIAN), OUACHITA MOUNTAINS, OKLAHOMA AND ARKANSAS

A southern proximal and a northern distal flysch facies are recognized in lower Stanley strata over an area of 5,000 sq mi in the southern and central Ouachita Mountains. Four distinctive tuffs (25–120 ft thick) interbedded with marine graywackes and shales serve as key units for detailed correlation of 8 sections 500–1,500 ft thick. Sandstone geometry, lithology, sedimentary structures, and ratio of sandstone to shale in the proximal and distal facies are similar to modern deep sea fans and associated basin sediments off the southern California coast. Individual sandstones appear to be discontinuous finger- to fan-shaped bodies on isopach and paleocurrent maps.

A gradational contact (10–100 ft) between the Arkansas Novaculite and the overlying lower Stanley strata over most of the Ouachitas records a gradual change from predominantly biological/chemical precipitation to clastic sedimentation. A local high, or highs, in the Ouachita trough is indicated by (1) novaculite conglomerate lenses, (2) an angular unconformity, and (3) thinning of the tuffs and strata between the tuffs.

The lower 500 ft of the Stanley Group is predominantly a distal flysch facies of shales and thin (6-in.) siltstones over much of the Ouachitas. The distal facies was superseded by a prograding wedge of proximal flysch facies in the southern Ouachitas. The proximal facies changes laterally to a distal flysch facies in the central Ouachitas. The source area may have been a northeastern extension of the buried Luling overthrust front of Texas.

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RELATION OF OIL OCCURRENCE TO SOURCE-BED DISTRIBUTION IN MOWRY SHALE

Rocks rich in organic matter are widespread in the Lower Cretaceous Mowry Shale and its marine time equivalents throughout much of the northern part of the western interior of the United States. In contrast, true source beds in which petroleumlike hydrocarbons have been formed have a restricted distribution due, apparently, to variations in the thermal history of the strata. Only in samples from areas where the Mowry has been buried more deeply than approximately 7,000 ft have petroleumlike hydrocarbons been found. Depth-of-burial studies, therefore, provide a valuable means for anticipating source bed development.

All known oil fields in the Muddy, Frontier, and other sandstone reservoirs associated with the Mowry interval are either within or updip and adjacent to areas where source beds have been found. Thus, the regional distribution of oil accumulations in these reservoirs is predictable with knowledge of the source-bed distribution.

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MISSISSIPPIAN CONODONT ZONES OF SOUTHEASTERN ARIZONA

Analyses of conodont faunas from Mississippian rocks in southeastern Arizona differentiate 7 conodont zones and 1 zone essentially barren of conodonts. Based on this conodont zonation, the Escabrosa Limestone ranges in age from late Kinderhookian (*Siphonodella isosticha-S. cooperi* zone) to late Meramecian (*Taphrognathus varians-Apatognathus-Cavusgnathus* zone). The Paradise Formation, represented by only the *Gnathodus girtyi-Cavusgnathus* zone, is middle Chesterian in age. Accordingly, the boundaries of both formations are represented by unconformities. The conodont fauna is large and diversified: 387 samples from 7 localities yielded 6,600 specimens representing 118 form species of 30 form genera. Species of *Siphonodella, Pseudopolygnathus, Polygnathus, Gnathodus, Cavusgnathus, Apatognathus,* and *Taphrognathus* are especially important in the zonation. The zonation recognized suggests relatively rapid transgression of Mississippian seas across a shelf of low relief in southeastern Arizona.

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PALEOGEOGRAPHY OF CINCINNATI ARCH AREA IN EARLY SILURIAN TIME

The Cincinnati arch is a platformlike structure located between the Michigan, Illinois, and Appalachian basins. Lower Silurian (Llandoverian) rocks crop out along the flanks of the arch but were removed almost completely from the central part of the structure by pre-Middle Devonian erosion. They consist primarily of marine limestone and dolostone. Paleontologic and lithologic evidence indicates that the Cincinnati arch area was the locale of a marine transgression in the early Llandovery, and regression and transgression during the late Llandovery. These events are summarized as follows.

1. Early Llandovery (A_1-A_1): There is an erosional unconformity between the Lower Silurian and Upper Ordovician; A_1 rocks are missing from this area. Silty A_2-A_4 dolomites are found solely on the east side of the Cincinnati arch.

2. Middle Llandovery (B_1-B_3): The arch was covered by a shallow epeiric sea resulting in the deposition of limestones and dolostones.

3. Late Llandovery (C_1-C_4): The depositional pattern of the area changed with the introduction of shales from the east (C_1-C_2). Shallow-water carbonates were deposited on the northern, western, and southern parts of the present arch. The interval from C_2-C_4 is marked by erosion and nondeposition, except for a few localities in southeastern Indiana where silty dolomites are found. The close of the Llandovery was marked by a second transgression of the sea with the deposition of shales on the southeastern side of the arch and carbonates on the northern, western, and southern sides.

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WORKING MODEL FOR BARRIER-ISLAND DEVELOPMENT ALONG LOW-ENERGY COAST OF GEORGIA

Studies of water-mass circulation and sediment transport adjacent to barrier islands of the Georgia coast indicate a more complex pattern of barrier-island development than has been previously suggested. The model here proposed emphasizes that shoal formation seaward from estuarine entrances is critical to development and growth of barrier islands.