

# ENVIRONMENTS OF DEPOSITION AND PALEOECOLOGY OF THE OIL CREEK FORMATION (MIDDLE ORDOVICIAN), ARBUCKLE MOUNTAINS AND CRINER HILLS, OKLAHOMA

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## ABSTRACT

The early Middle Ordovician Oil Creek Formation (Simpson Group) of southern Oklahoma is composed of 3 major units: a basal sandstone of variable thickness; a thick, mixed carbonate-clastic unit; and a relatively thin, fine-grained carbonate unit. The basal sandstone, known as the Connell Sandstone in the subsurface, is a fine-grained, well-sorted, and well-rounded quartzarenite with rare sedimentary structures. The middle unit consists of thin-bedded, sandy, fossiliferous packstones alternating with thin beds of essentially barren, greenish-gray shale. The uppermost unit is composed of ?algal wackestone and silty pelsparite beds in the Arbuckle Mountains and algal-"birdseye" mudstone in the Criner Hills (Pruitt Ranch Member).

The environment of deposition of the basal sandstone is difficult to interpret because of the near absence of sedimentary structures. Nearly planar beds, small-scale tabular cross-beds, symmetrical ripples, and horizontal and vertical burrows, found mostly in the uppermost part of this unit, suggest an upper shoreface environment.

The vertical sequence above the basal sandstone represents a transgressive-regressive cycle with a range of depositional environments and associated fossil assemblages. Estimates of skeletal biovolume were used to rank the faunal elements in each facies.

The transgressive phase is represented by 3 facies in an onshore-offshore sequence. The shoreface facies is characterized by calcite-cemented quartzarenites with small- to medium-

scale tabular cross-beds and small-scale trough cross-beds, sandy biomicrites, and shales. The fauna is dominated by vertical and horizontal burrows, the large ostracode *Eoleperditia*, triobites, and the brachiopod *Orthambonites*. This grades through a transitional facies to an off-shore facies which is recognized by megaripped biomicrite beds alternating with shale and by the decreased amount of sand in this interval. The diverse, echinoderm-dominated fauna found here includes a new genus of eocrinoid, crinoid holdfasts, ramose and massive bryozoans, the small ostracode *Leperditella*, and brachiopods, especially *Anomalorthis*.

Three major facies also occur in the upper, regressive phase. The shoal facies consists of relatively thick beds of sandy biomicrite and biosparite, thin quartzarenite beds, an oolite bed, and shale. Many skeletal elements are fragmented in this high-energy environment. Echinoderms, ramose bryozoans, and bivalves are considered part of the original community. A lagoonal facies is recognized by the abundance of shale and by its stratigraphic position. The relatively high diversity of the fauna and the presence of echinoderms, bryozoans, and brachiopods indicate normal or nearly normal salinity. The tidal flat facies of the Arbuckle Mountains contains pelsparite and pelmicrite beds with silt laminae which appear to be algal in origin. The restricted fauna is dominated by several genera of gastropods and by the ostracode *Eoleperditia*.