THE ANCIENT ENVIRONMENT

IOLA FORMATION
by L. A. Desjardins

The restless sea advanced again over the marshland and shore sands of the Chanute terrane, to form new shell banks, offshore sand bars, and submarine mud flats. Sea creatures abounded at this time in the Tulsa area, and left an excellent fossil record.

Three major periods of shallow-water shell-bank formations were separated by deeper water clay-shale deposition. The resultant strata are collectively grouped into the Iola Formation, traceable into the sequence of the same name in Kansas. The total thickness in Tulsa County is 85 feet, of which only about 40 feet is limestone, occurring as 3 members: upper, middle, and lower (Pi₂, Pi₃, and Pi₄), with 2 shale intervals.

The lowest of the limestones is correlated with the Paola Member in Kansas, and that name is applied here because certain distinguishing characteristics are recognized. It thickens in the south half of T19N-R10E, ranging from 2 to 5 feet, and contains oolites, fossil fragments and scattered glauconite grains. Dolomitization has altered it locally to a light brown, very fine granular rock. It thins northward, and is more sandy, but generally fossiliferous. Phosphatic nodules in the overlying shale are a diagnostic feature from Kansas south to Tulsa County and beyond (Okla. Geol. Surv. Bull. 62, pp. 68-71, and Bull. 69, pp. 81-81.)

The 25-foot interval above the Paola is dark gray calcareous shale, containing one of the richest marine faunas in northeastern Oklahoma. Brachiopods, crinoids, bryozoans, goniatites, and trilobites can be collected in great profusion along State Highway 51, in the southeast part of Section 11, and in the northwest part of Section 25, T19N-R10E. This fauna identifies the member as the equivalent of the Muncie Creek Shale of Kansas.

The middle limestone member is the bed previously referred to as "Lower Avant" (Okla. Geol. Surv. Bull. 69, pp. 82, 85), and is traceable to a horizon at or just below the basal portion of the Avant Limestone of the type locality in T23N-R12E, Osage County. It is the thickest limestone member of the Iola Formation south of the Arkansas River, ranging from about 10 to 25 feet. In the south half of T19N-R10E, its outcrop separated locally into 2 or 3 beds at a little distance from each other, but with the uppermost ledge generally the thickest. The rock is typically light gray massive-bedded algal calcilutite, locally with brown, medium-to-coarse, granular dolomite bands.

Above the middle limestone member is a varied sequence, about 25 feet thick, with some thin fusulinid and productid limestone lenses in the lower half, and with very thin sandstone laminae in its upper half, overlain by 10 to 15 feet of massive fine-grained sandstone.

Capping the sandstone is the uppermost limestone member of the Iola Formation, as herein defined for Tulsa County: (Pi₄). Its texture suggests an algal mat environment with traces of dessication cracks. With its underlying sandstone it forms a single prominent topographic bench. North of the Arkansas River, and continuing into Osage County, outcrops show progressive replacement of this sandstone by calcareous layers, and the zone northward probably grades into the upper, or even middle, portion of the Avant Limestone of the type locality.

In Tulsa County, this has previously been designated "Upper Avant" (Okla. Geol. Surv. Bull. 69, pp. 82-85). On the accompanying geological map, this unit is designated the Keystone Dam Limestone which is a tentative name proposed by Bennison. Desjardins, who first used the local designations "Upper and Lower Avant" (private publication, 1940), still considers these terms as the best to use in southern Osage, Tulsa, and Creek counties. The type locality for "Upper" and "Lower" (measured section on Desjardins' map accompanying this publication) is in the bed and bank of Brush Creek, east side of Sec. 4,