UPPER CARBONIFEROUS AMMONOID EMBRYONIC SHELL CLUSTERS: TRANSPORTED ACCUMULATION OR IN SITU NESTS?

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Clusters of ammonoid embryonic shells have been discovered in several carbonate concretions from a dysoxic, relatively deep water shale (Heebner Shale-Oread Formation) of Virgilian (U. Carboniferous) age near the community of Pomona, Kansas. The concretions from a single outcrop display four distinct units. Unit 1 is the lowest unit and has an evenly laminated fabric with scattered embryonic and juvenile ammonoids, gastropods, and bivalves. The bedding fabric of this unit is interrupted and truncated by a series of pits that form the base of Unit 2, which is a sharply bounded discontinuity. Within the pits there are embryonic ammonoid clusters up to 2.5 cm thick containing as many as 250 individuals per cm^3. Some juvenile ammonoids and shell fragments (mostly of ammonoids) are also present. These clusters are capped by Unit 3 which has a gradational boundary with Unit 2. Unit 3 consists in places of a packstone of fossil debris including ammonoid body chamber and phragmocone fragments, three genera of juvenile ammonoids, embryonic ammonoids, and more rarely brachiopods, bivalves, and orthoconic nautiloids. Elsewhere, fossils of Unit 3 are well separated by matrix, which lacks the bedding fabric characteristic of Unit 1. The ammonoids in Unit 3 include mature to sub-mature fragments of Aristoceras and sub-mature phragmocones of Glaphyrites and Shumardites. The brachiopods (articulate and inarticulate) and the bivalves are probably sub-mature or mature. Planktonic bivalves are extremely rare. The number of shell fragments of embryonic and postembryonic ammonoids and other shell fragments decreases upwards from the upper contact of Unit 2. The boundary of Units 3 and 4 is more-or-less gradational; Unit 4 has a sedimentary fabric and faunal content like that observed in Unit 1.

One set of hypotheses to explain the embryo clusters in Unit 2 emphasizes sedimentological processes such as selective transportation and accumulation by currents, turbidity transport and storm deposits. Another set of hypotheses favors biological activities such as reproductive activity and egg-laying. If this second set of hypotheses is correct, these clusters would provide the first documentation of ammonoid reproductive activity and would represent a find as significant in its way as that of the nests of embryo bearing dinosaur eggs.