

## ONTOGENETIC AND EVOLUTIONARY PATTERNS OF SEPTAL NECK TRANSFORMATION IN THE AMMONOIDEA

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Four types of septal necks are present in the Ammonoidea: (1) retrochoanitic (entirely projected adapically), (2) modified retrochoanitic (projected adorally or both adorally and adapically on the dorsal side and adapically on the ventral side), (3) amphichoanitic (projected both adorally and adapically), and (4) prochoanitic (entirely projected adorally). Each septal neck is continuous with the rest of the septum and consists primarily of a nacreous layer. A spherulitic-prismatic deposit called the auxiliary deposit commonly appears on the adoral side of the septal neck and covers the inner surface of the nacreous layer. Another spherulitic-prismatic deposit (cuff) may also occur on the adapical side of prochoanitic necks. In all of the Paleozoic suborders except Goniatitina (Prolecanitina, Bactritina, Anarcestina, Agoniatitina, Clymeniina, Gonioclymeniina and Tornoceratina), type 1 necks are present throughout ontogeny (1→1). In the Goniatitina as well as in the Ceratitina, type 1 necks either persist throughout ontogeny (1→1) or develop into type 2 necks (1→2). In the Phylloceratina, type 1 necks are present in early to middle ontogeny, later developing into type 3 necks (1→3). In the Lytoceratina, type 1 necks are only present in very early ontogeny and are immediately replaced by type 4 necks (1→4). In the Ancyloceratina and Ammonitina (with few exceptions), only type 4 necks occur (4→4). Type 1 necks evidently represent the primitive condition. Variation among suborders in the ontogenetic timing of the transformation from the primitive condition to one of the three more derived conditions may be the result of heterochronic processes such as acceleration or predisplacement. However, the pattern of septal neck transformation within suborders is more or less stable and was probably established at the time each suborder originated.