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### **Shale Facies Stacking in Parasequences of the Cretaceous Blackhawk Formation, Book Cliffs, Utah**

Shales from the Kenilworth Member of the Blackhawk Formation (Campanian, Book Cliffs of Utah) were investigated for facies characteristics and lateral/vertical variability. In a proximal setting, the following shale facies are stacked (bottom to top) to form a given parasequence: (1) bedded-bioturbated gray shales with well preserved storm layers (silt and fine sand); (2) intensely bioturbated gray mudstones; (3) moderately bioturbated gray shales with storm layers (silt and fine sand); (4) bioturbated sandy mudstones (intercalated HCS beds). Shale facies stacking is well developed in proximal sections where individual shale facies packages may show sharp and abrupt boundaries. In distal sections, however, very gradational changes are the norm although there is still a recognizable upwards change in shale facies.

In proximal sections, facies (2) stands out by its intense bioturbation. Overall bioturbation is more intense in distal sections, and is more evenly distributed through a given parasequence. Style of bioturbation changes as well, with "Chondrites" type burrows being ubiquitous in distal mudstones. Considering the mix of "background" sedimentation processes (e.g. storm deposition, settling from river plumes, bottom current reworking etc.), proximal facies reveal a greater variety of processes, whereas distal facies is dominated by muddy tempestites.

The observed facies succession reflects initial shallow water mudstone deposition (1), followed by maximum flooding and slow sedimentation (2), and then gradual shallowing and increase in sedimentation rate (3 & 4). The observed basinward increase in vertical uniformity suggests that in absence of sandstone interbeds, differentiation of parasequences from sedimentological observations alone will be difficult.