

Depositional History of the Central Appalachian Region during the Cambrian—Ordovician Sauk Megasequence

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In the central Appalachians, carbonate deposition of the Great American Carbonate Bank began during the Early Cambrian with the deposition of ramp facies. Vertical stacking of bioturbated subtidal ramp deposits and dolomitized microbial boundstone led to the initiation of platform sedimentation, a sand shoal facies, then development of peritidal cyclicity. Initiation of peritidal deposition coincided with development of a rimmed platform that would persist throughout much of the Cambrian and Early Ordovician. The platform became subaerially exposed during the Hawke Bay regression, bringing the Sauk I Sequence to an end.

The basal Sauk II transgression during the early Middle Cambrian submerged the platform and reinitiated the peritidal cyclicity that had characterized the pre-Hawke Bay strata. This thick stack of meter-scale cycles is preserved as the Pleasant Hill and Warrior Formations of the Nittany Arch (central Pennsylvania), the Elbrook Formation of the Great Valley (VA, MD), and the Zooks Corner Formation of the Conestoga Valley (eastern PA). Deposition of peritidal cycles was interrupted during deposition of the *Glossopleura* and *Bathyriscus-Elrathina* trilobite Zones by 3rd order deepening episodes that submerged the platform. Regressive facies of the Sauk II Sequence produced platform-wide restrictions and deposition of the lower sandy member of the Gatesburg Formation, the Big Spring Station Member of the Conococheague Formation, and the Snitz Creek Formation. Re-submergence of the platform was initiated during the late Steptoean (*Elvinia* Zone; medial Late Cambrian) with the expansion of extensive, subtidal thrombolitic boundstone facies. Vertical stacking of no fewer than four of these thrombolite-dominated intervals records 3rd order deepening episodes separated by intervening shallowing episodes that produced peritidal ribbony and laminated, mudcracked dolostone.

The maximum deepening of the Sauk III transgression produced the Stonehenge Limestone in two 3rd order submergences. Subsequent circulation restriction during the Sauk III regression produced a thick stack of meter-scale cycles of the Rockdale Run Formation (VA, MD) and the upper Nittany, Epler, and lower Bellefonte formations of the Nittany Arch. This regressive phase was interrupted by a 3rd order deepening event that produced the “oolitic member” of the lower Rockdale Run and the Woodsboro Member of the Grove Formation in the Frederick Valley, MD. Platform exposure and extreme circulation restrictions marked the end of the Sauk Sequence and resulted in the Knox/Beekmantown unconformity over most of the Appalachian region. In the central Pennsylvania/W. Maryland/N. Virginia depocenter, however, sedimentation continued, and the sequence boundary is represented there by the “dolomite member” of the Rockdale Run and the Bellefonte Dolomite of the Nittany Arch.

Restricted circulation continued through much of the Whiterockian in this region, with the deposition of the uppermost Rockdale Run, the Pinesburg Station and middle and upper parts of the Bellefonte Dolomite of the Great Valley and Nittany Arch regions. During deposition of the Tippecanoe Sequence, beginning late in the Whiterockian, the peritidal shelf cycles were re-established during deposition of the St. Paul Group (MD) and the Loysburg Formation (central PA).