sible facies relationships between the several types of limestone may contribute to a better understanding of the sedimentary environment.

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CARBONATE CYCLES: LOWER PENNSYLVANIAN MARBLE FALLS FORMATION, MASON AND KIMBLE COUNTIES, TEXAS

Samples from detailed measured sections were successfully classified by using Folk's descriptive limestone classification. Later in the investigation genetic rock categories (facies) that reflect ecologic environments were recognized and classified separately. The nine facies are shown in the following table.

Facies Name	*Characteristics*	*Inferred Environment*
1. Mottled facies	Pale yellowish brown fragmental biosparite and burrowed biomicrite containing fusulinids, paleotextulariids, *Calcitornella*, *Millerella*, and *Bradyina*	Nearshore and tidal flat of transgressive and regressive facies tracts
2. Churned dark fragmental facies	Dark gray fragmental biomicrite with disoriented grains	Middle shelf; transgressive facies tract
3. Laminated dark fragmental facies	Laminated, locally graded, dark fragmental spiculitic biomicrite; evenly bedded with shale interbeds	Seaward slope beyond shelf edge; mostly transgressive facies tract
4. Light fragmental facies	Light gray fragmental biomicrite and pelmicrite	Middle shelf, seaward of *Ivanovia* facies; transgressive facies tract
5. *Ivanovia* facies	Light olive-gray *Ivanovia* biolithite	Middle shelf with dark fragmental facies to landward, and light fragmental facies to seaward; transgressive facies tract
6. Tubular alga facies	Medium to light gray, delicately branching red alga biolithite; probably a growth form of *Komia*	Shelf edge in deep or protected areas; transgressive facies tract
7. *Komia* facies	Coarse-grained, light gray biosparite, containing *Komia*, fusulinids, and crinoid fragments; or fine-grained biosparite and biomicrite containing *Calcitornella*, *Millerella*, and calcite spicules	Shelf edge in shallow or turbulent areas; transgressive facies tract, or seaward slope beyond shelf edge; regressive facies tracts
8. *Chaetetes* facies	*Chaetetes* biostromes in pale yellowish brown biomicrite containing mat algae, fusulinids, *Calcitornella*, *Komia* fragments, paleotextulariids, *Bradyina*, *Ozawainella*, laminated shell fragments and gastropods.	Shelf, on surfaces of bypassing; regressive facies tract
9. Shale facies	Very dark gray shale	Shelf and seaward slope beyond shelf; mostly transgressive facies tract

A transgressive facies tract can be identified, comprising four depositional areas: (1) nearshore and tidal flat, bearing the mottled facies; (2) middle shelf composed either totally of the churned dark fragmental facies or of *Ivanovia* banks with the churned dark fragmental facies to landward and the light fragmental facies to seaward; (3) shelf edge with algal banks or knolls, the tubular alga facies in deeper or protected areas, the *Komia* facies in turbulent or shallow areas; (4) seaward slope bearing the laminated dark fragmental facies grading seaward to the shale facies.

The regressive facies tract begins with the seaward migration of the mottled facies and the lateral expansion of the *Komia* facies. It culminates on the shelf with the mottled facies and *Chaetetes* facies which developed on a surface of bypassing, and on the slope by deposition of debris transported from the *Komia* facies.

Cycles have four phases: (1) minor transgression with shale at the base overlain by a poorly developed regressive facies tract; (2) slight regression with a poorly developed regressive facies tract; (3) major transgression with well developed transgressive facies tract; (4) major regression with well developed regressive facies tract.

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APPALACHIAN TECTONIC DEFORMATION AND THE DEEP BASIN

Much of the central Appalachian region fits a single geometric pattern that is bilaterally symmetrical to an axis or radius passing N. 40°W. from the Baltimore dome through the high point of the Nittany arch. Many elements are likewise concentric to a focus situated on that axis near Baltimore and (or) are symmetrically tangential to a baseline that crosses the above axis at right angles in the vicinity of Baltimore. It is suggested that all of these symmetrical features result from (a) primary uplift of the Baltimore dome with outward gravitational sliding in the overlying skin of sediments; (b) a secondary forward movement along the axis of a crustal block containing the Baltimore dome; or (c) some combination of these two factors.

There is possible distortion of this symmetry along a conjectured slip- or wrench-fault at about Lat. 40° N., which may involve a dextral offset amounting to 80 or more miles along a trace now concealed by younger sediments or the Atlantic Ocean, from the Susquehanna River eastward to the Kelvin Seamount Group, 400 miles offshore at Lat. 40° N.

The nature of the deep part of the central Appalachian basin is reviewed in the light of a general theory of