nolites, Chondrites and *Thalassinoides,* (2) glauconitic wackestones, (3) rudist-*Orbitolina* wackestones, and (4) oolitic-bioclastic grainstones. These carbonate facies are associated with cross-bedded coastal marine and platform quartzarenites and silty carbonaceous lagoonal facies. Facies 1, which overlies the basal transgressive clastic wedge, is interbedded with thin rudist-bearing wackestones and algal grainstones. This algal wackestone facies represents deposition in restricted marine back-bar/back-reef conditions. The glauconitic facies 2 was also deposited in a relatively tranquil environment of the back-bar. Facies 3, of alternating thin *Orbitolina* and rudist-wackestone, contains numerous biogenic tubular structures filled with *Orbitolina* grainstone. The rudists (caprinids and Toucasia) are mostly unoriented and matrix-supported. This facies probably represents local reefal-biostromal development on an oxygenated marine shelf. The oolitic grainstone (facies 4) is a facies diagnostic of shoaling-upward sequences within or at the margin of the platform. Ammonites and ahermatypic solitary corals at the top indicate a gradual deepening of the environment. The overlying basinal Luna Formation represents the acme of transgression of the Cretaceous period which resulted in an overall upward-fining megacyclothemic sequence.

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Morphometry of Late Ordovician Microbial Borings

Microborings within Late Ordovician shells of the brachiopod *Raphinesquina alternata* from the Tanner Creek Formation, Richmond Group, of southeastern Indiana, were studied by scanning electron microscopy of their resin casts. The shells have been exposed to microbial boring in quiet and illuminated waters below the wave base and then buried with skeletal fragments of ramose bryozoans, echinoderms, trilobites, and rugose corals.

Four morphotypes of microborings have been characterized on the basis of shape, branching patterns, and diameter size and variation. Statistically evaluated measurements for populations of microborings indicate four ichnotaxa.

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Deposition of Enewetak Atoll Reef, Middle Pleistocene to Holocene

Cyclic deposition and diagenesis of a large atoll reef, associated with major eustatic sea-level fluctuation, is documented in six cores from the northeast (windward) reef of Enewetak Atoll. To 250 ft (76 m) depth, the reef section comprises six primary depositional packages that represent periods of reef growth during Pleistocene and Holocene high sea-level stands. These depositional packages are separated by unconformities, former subaerial exposure surfaces, which are demarcated by paleosols. During emergent periods at low sea-level stands, the reef was subjected to meteoric-water diagenesis. However, the depositional textures generally are well preserved. Diagenetic textures, most indicative of meteoric-vadose diagenesis, usually have only partly replaced original textures. An oceanward shift of reef environments through time is apparent in a large-scale view of the cores. Reef crests in succeedingly younger depositional packages apparently are offset oceanward. Younger marginal lagoonal deposits unconformably overlie older backreef deposits that unconformably overlie older reef-crest deposits. Within depositional packages, influence of rising sea level on facies development is evident. Subaerial surfaces flooded by rising sea level were rapidly colonized by both solitary corals and patch reefs of diverse composition. Rapid upgrowth of oceanward reef crests led to moderation of wave energy in backreef areas and great increase in deposition of sediment which locally buried and killed patch reefs. Shoaling of backreef areas by sediment aggradation to a stabilized sea level resulted in renewed development of patch reefs and deposition of coarser sediment.

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Calcification Model and Secondary Calcification Effects on Fossil *Bolivina seminuda*

Fossil individuals of *Bolivina seminuda,* studied with an SEM, reveal a tripartite test-wall ultrastructure composed of (1) an underlying organic lining with pore structures, (2) a radial calcitic layer bounded by organic membranes, and (3) a calcitic surface veneer. A calcification model for *Bolivina seminuda* is proposed where the inner organic lining is precipitated first. Overlying this is a layer composed of radial calcite with the crystallographic C-axes aligned perpendicular to the test wall. This calcite is laid down in successive packets bounded above and below by organic membranes. Above this is a surface veneer composed of randomly oriented calcite rhombs. This model differs from some proposed models by the absence of a randomly oriented calcite rhomb layer incorporated with each packet of radial calcite and by attributing the surface veneer to inorganic precipitation.

The surface veneer is interpreted as diagenetic in origin and not precipitated by the organism. The diagenetic calcification patterns at first enhance preexisting surface sculpture and then gradually mask it. This coating makes the different phenotypes of *Bolivina seminuda* similar to one another and to other species in appearance. The effects of this calcification must be considered in taxonomy, biostratigraphy, and paleoenvironmental interpretations.

SEM studies of the ultrastructure of *Bolivina seminuda* indicate which test-wall parameters are controlled by genetics, environment, and postdepositional (or postmortem) history. The raw data may be of use in subsequent investigations of paleoenvironments, taphonomy, and postdepositional (or postmortem) history.

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Application of Statistical Models in Continental Margin Biostratigraphy

Stratigraphic events defined by the highest or lowest