units in adjacent stratigraphically equivalent sections with different silica phases show that most porosity reduction during these transformations resulted from compaction, not from addition of silica.

In calcite-bearing siliceous rocks, the pattern of porosity reduction was similar, and minor additional reduction was caused by silica filling of some foraminiferal tests. In calcite-bearing rocks, with moderate (10 to 40%) silica, only 5 to 10% of porosity was lost during each silica phase transformation, and additional gradual compaction occurred in the interval between the two transformations, presumably in response to increased burial load. Formation of disseminated dolomite, in contrast to the rarer formation of highly cemented dolomite beds and nodules, was accompanied by only moderate reduction in porosity (0 to 10% porosity).

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Composition of Particles and Cements in Lower Cambrian Reefs and Precipitation of Metastable Carbonates in Paleozoic Ocean

Bioherms and biostromes of the Lower Cambrian Forteau Formation in southern Labrador and western Newfoundland are rich in skeletal and nonskeletal components and display a wide sprectrum of synsedimentary and postdepositional cements. Through petrography, cathodoluminescence and microprobe analysis, three types of components can be distinguished: (1) molds filled with iron-rich or iron-poor calcite spar or iron-rich dolomite (archaeogastropods, hyolithids, brachiopods, ?coelenterates, and *Chancelloria*); (2) particles composed of iron-poor calcite and showing original or relic texture (trilobites, salterellids, echinoderms, and sponge spicules); and (3) components illustrating both the above fabrics (ooids, archaeocyaths, and *Renalcis*). Synsedimentary cements are (1) rays or botryoids in which each acicular crystal is a spar-filled mold, or (2) rinds of fibrous calcite commonly with fascicular-optic properties.

Comparison with the petrographic characteristics of Phanerozoic and modern carbonates indicates that those Cambrian particles and cements which are now spar-filled molds were originally high porosity aragonite; those without a void stage and retaining original fabric were calcite or Mg-calcite; those with a fibrous habit were Mg-calcite, and those which exhibit two or more of the above characteristics were low porosity aragonite or high porosity Mg-calcite.

These styles of preservation confirm that organisms in Early Cambrian were secreting skeletons with the same spectrum of mineralogies as those to today and that metastable carbonates (aragonite and Mg-calcite) were being precipitated on the shallow sea floor, as they are in the modern ocean. The absence of similar fabrics at other times in the Phanerozoic probably reflects epeiric sea rather than continental margin sedimentation and not a gradual change in seawater chemistry or atmospheric CO_2 through time.

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Fossil Carbonate Platform Margins

The margin of carbonate shelves and platforms is a critical zone. During construction these margins control both the geometry and the style of sedimentation on the adjacent platforms. After burial they remain a major interface between carbonate and detrital sediments, a preferred site for both hydrocarbon and metallic mineral entrapment. During later deformation the structural style commonly changes across this zone.

Fossil carbonate margins occur in two realms: (1) along the craton margins, bordering Paleozoic and earlier ocean basins that are now fragmented and deformed in major mountain belts or buried beneath Mesozoic and Cenozoic successions along modern continental margins, or (2) around the edges of Paleozoic platforms developed in major basins on large cratons.

Regardless of setting, two different sedimentary styles recur. Rimmed margins, those composed of an elevated rim of bioherms or carbonate sand shoals, exhibit a marked declivity between shelf and basin. This slope is either gentle, gradually changing from shallow into deeper water sediments (depositional slope), or is a steep incline, with little sediment accretion, over which sediments move on their way to the basin (bypass slope). Slope and toe-of-slope sediments in these settings exhibit a full spectrum of hemipelagic ribbon and parted limestones, hardgrounds, slides and slumps, and sediment gravity flows together with submarine erosion. Open margins or ramps, those in which there is no marked shelf break, gradually change from inner shelf to slope strata. The high-energy zone is located well inside the craton margin on the platform or at the strandline. Deeper water shelf limestones are particularly common in these situations while slope deposits are characterized by hemipelagic deposits but fewer examples of gravity flow deposits.

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Mesozoic Carbonate Platforms and Banks of Eastern North American Margin

The Jurassic-Lower Cretaceous carbonate platforms and banks form a discontinuous belt extending from the Grand Banks to the Bahamas, a distance of over 6,000 km. Six types of carbonate buildups are recognized that document the variability of depositional, paleo-oceanographic, and tectonic processes on the eastern North American margin. The texture of the carbonates closely resembles recent deposits of the western Great Bahama Bank in that oolitic grainstones were present near the shelf edge, and skeletal, peloid wackestones and mudstones (biomicrites) were deposited in the inner part of the platform. Coral-stromatoporoid and sponge bioherms were rare constituents of the carbonate banks.

The thickness of carbonate buildups progressively increases southward along the margin attaining a thickness of more than 5 km in the Bahamas. The platforms also become younger southward, which is thought to reflect the northward movement of less than 1.5 cm/year of the North American plate. The carbonate platforms were seeded over the continental basement following the taphrogenic period of plate tectonics.

The building of carbonate ramps characteristic of the Early Jurassic began during a transitional period between continental rifting and early drift of the continental plates in the North Atlantic. The second stage in construction of the carbonate platforms and offshore banks proceeded mainly after separation of the continental plates.

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