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STROMATOLITIC MICROFABRIC: PETROGRAPHIC MODEL

Serial, stained peels, at 10–20 μ intervals, show that a combination of organic and inorganic mineral stains distinguishes between original framework and diagenetic product in a suite of carbonate stromatolites from the Bitter Springs Formation of central Australia. Five laminar microfabrics are recognized: (1) particulate (125–400 μ diameters); (2) wispy laminations (0.5–1.0 mm thick); (3) grumous aggregates with knobby surfaces; (4) mixed calcite and dolomite "brick-and-mortar" texture; (5) saccharoidal dolomite. These original textures are exaggerated by diagenesis and are comparable with recent Bahamian and Floridian microfabrics of organo-sedimentary origin. They recur both vertically and laterally within a single columnar stromatolite and between parallel intervals in adjacent columns.

A calcite particle (125–400 μ) which preferentially absorbs organic and bacterial stains forms the basic stromatolitic unit structure. It is commonly encompassed by 10-μ dolomitic halo, and is more distinct in bedding peels than in vertical sections where it tends to aggregate with its overlying neighbor. The loose packing and aggregational tendency suggest an unconsolidated origin comparable with Holocene particulate matter of debated sedimentary/fecal/bacterial origin.

Grain-supporting algae are not found. However 2 sizes of dichotomizing transgressive dolomitic tubules (20 μ in diameter), which are reminiscent of voids left by bunches of filaments and meiobenthonic worms, commonly form the basis of the "mortar" fabric. Intrastromatolitic unconformities abound and the contact with the interstromatolitic dolomite, which comprises 400-μ detrital particles with overgrowths, is generally sharp. Periodic wispy laminated drapes outline the original stromatolite's amplitude, and an incorporated dolomitized brachiopod suggests that the interstromatolitic dolomite may have been contemporaneous shell hash.

Diagenetic rhomboidal carbonate distributions are attributed to contemporaneous migrant Mg-rich brines which are size specific and give *lit par lit* replacements which can be traced into intrastromatolitic faults with 2-mm displacements.

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PALEOGEOGRAPHY, PALEOHYDROLOGY, AND DIAGENESIS OF MIDDLE TRINITY (LOWER CRETACEOUS) CARBONATE BEACH SEQUENCE, TEXAS

The Hammett Shale, Cow Creek Limestone, and overlying Hensel Sandstone represent a transgressive-regressive depositional cycle. Hammett shales and carbonates were deposited in low-energy marine lithotopes seaward of nearshore shoal, lagoonal, and beach environments represented in Cow Creek lithofacies. Fungalgal caliches and supratidal marshes developed in places in the beach backshore. Contemporaneously, smectitic red muds, caliches, and lenticular sands were deposited on the arid Hensel alluvial plain. Statistical analysis of matrix, cement, and allochems reveals that early diagenetic modifications in the marine carbonate sequence have distinctive vertical distributions. Fewer beds are dolomitized above the Hammett Shale. Lagoonal strata consist mainly of recrystallized pelleted nodules and pseudospar lime packstones; and beach grainstones are never dolomitized.

Aragonitic bioclasts underwent dissolution in the beach but stabilized by inversion in lower facies. Iron-free calcites predominate in the beach foreshore beds; ferroan calcites predominate in underlying units. Micritized and enveloped grains are most abundant in mud-free beach sediments.

The strandline meteoric-vadose zone and the mixed zone separating local and regional meteoric-phreatic waters from marine interstitial fluids were the loci of most diagenetic alteration. Caliche development, early cementation, and grain leaching were affected by equilibrating vadose waters. Cementation was inhibited and inversion allowed to proceed in the local mixed-phreatic zone, whereas dolomitization of Hammett carbonates took place in regional mixed-phreatic waters. Iron-free cements were precipitated in oxidized, phreatic, or vadose zones.

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SCLERACTINIAN CORAL ALTERATION IN SUBAERIAL VADOSE DIAGENETIC ENVIRONMENT

Exoskeletons of scleractinian corals in the elevated late Pleistocene reefs on northern Barbados illustrate a series of diagenetic textures that document aragonite coral alteration under subaerial vadose conditions. Two major solution-precipitation processes are recognized: (1) concomitant solution-precipitation on a fine scale leading to preservation of coral microstructure; and (2) total leaching and destruction of the microstructure followed by later precipitation of void-filling spar.

The pathway of aragonite solution in both processes is similar and controlled by the original coral microstructure. Solution is initiated in the fine equant crystallites forming the axis (center of calcification) of each trabecula and moves outward into the surrounding zone of closely packed aragonite needles by preferential solution along the linear intercrystalline contacts between needles. This results in the friable aragonite "chalk" commonly observed in Pleistocene corals.

Aragonite "chalk" is also observed as a zone between aragonite and calcite in corals undergoing solution-precipitation on a fine scale. The coral microstructure is preserved by concomitant precipitation of calcite between separated aragonite needles adjacent to the calcite alteration front, incorporating minor impurities and irregularities of the original structure into the calcite crystals. This results in a new calcite texture that mimics the original aragonite one.

Corals completely altered to calcite by concomitant solution-precipitation on a fine scale exhibit a coarse mosaic of blocky calcite with a relict fibrous texture. The once dark trabecular axes are preserved as a clear central canal. A similar calcite trabecular texture is observed in certain Devonian tabulate corals and other fossil calcareous organisms, suggesting that their skeletons may have been aragonite and altered in a manner similar to that described.

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DIAGENESIS OF OOLITES IN LODGEPOLE FORMATION (MISSISSIPPIAN), CENTRAL MONTANA

Several cross-stratified ooid and bioclastic grainstone layers are present in the upper part of the cyclically deposited Mississippian Lodgepole Formation in cen-