c4 The origin of micrite, sparite, and oolite < Bahama Banks >

> ... full of confidence that we understand waves both in theory and by actual test, we fling open the laboratory door, stride to the edge of the cliff and look to sea.
>
> Good grief! The real waves look and act nothing like the neat ones that endlessly roll down the wave channel or march across the blackboard in orderly equations. ... Should we slink back inside to our reliable equations and brood over the inconsistencies of nature? Never! Instead we must become outdoor wave researchers. It means being wet, salty, cold – and confused.
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> —**Willard Bascom** (1916-2000) *Waves and Beaches*, 1964.[1]

In low energy aqueous environments (bayous or sloughs (pronounced: *slews*), lagoons, shallow seas and lakes, and tidal flats) silts and clays settle away from shores and below the level of wave disturbance. In warm climatic zones, seaward of undercurrent distributed terrigenous sediments, pure chemical and biogenous salts can accumulate on shallow seafloors (as on the Great Bahama Bank).[2]

Common in shallow, warm, marine environments are calcium carbonate ($CaCO_3$) muds of: aragonite crystals (which in time recrystallizes as calcite) that are evaporation precipitates (evaporites), post-mortem disintegrated calcareous green algae (*Halimeda* and *Penicillus*),[3] and *not* the result of parrotfish making sand by munching on coral with their beaks as Darwin intimated.[4] Lime mud hardens in time as a result of solution of smaller and precipitation on larger crystals in the same mass. This diagenesis (which is the general name given to any change within a sediments that lithifies it) can result in a rock of uniformly silt-sized grains. Limestone (lms) with that texture is called *micrite* (microcrystalline calcite or *lithographic limestone* for its use in printing). Diagenesis can grow calcite crystals to diameter >4 micrometers, and with that "sparry calcite" matrix texture, the limestone is called *sparite*. Sparry calcite can also occur as a cement (a primary component).

Waves of oscillation, in open water that is less than half their wavelength in depth, by their back and forth traction, shape sediments on the seafloor into oscillation ripples. Under such conditions, in warm climatic zones in the marine environment, evaporation precipitates aragonite on shifting particles. As these become coated they grow somewhat like rolling snowballs into spheres called *oolites*. Once growing oolites have reached sand-size they can be easily redistributed by wind- and tide-generated currents and travel forming migrating submarine bars and ripples to ultimately come to rest along with settling lime muds in quieter water below the beveling level of the wave base. So, in low-energy shallow marine (or saltlake) environments in warm climatic zones, accumulations of calcareous muds of evaporite and biogenous origin and drifted in oolites are common seaward of any contemporaneous accumulations of terrigenous sediments.[5]

Classification of carbonates

Suitable for hand-specimen field descriptions is the system of **Francis John Pettijohn** (1904-1999), 1975: percentage proportions of clastic components (terrigenous, detrital) and non-clastic components (bioclasts and chemical/biochemical intraclasts, ooids, peloids, micrite and sparite.[6]

Carbonate descriptions are also by R. L. Folk, 1962: composition in terms of different forms of $CaCO_3$ (seen in thin-sections),[7] and by R. J. Dunham, 1962: texture in terms of percentage of matrix and type of support (seen when using a hand lens or a binocular microscope).[8] ❑