precise data pertinent to the existence of favorable structures.

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CALCIFIED ALGAL FILAMENTS IN REEFS: CRITERION OF EARLY DIAGENESIS

Calcified algal filaments are a prominent and probably diagnostic feature of the extensive syngenetic submarine cementation in recent Bermudan reefs. The filaments occur within millimeter- to decimeter-size cavities of the reef frame to depths of at least 12 m; they range from 20 to 300μ in diameter and are up to 5 mm long. The filaments are wormlike threads with lateral branching and commonly form an irregular meshwork which lines or fills the cavities; the meshwork commonly incorporates fine sediment that is in turn cemented.

SEM photographs show that the original filaments are enveloped by crusts, 5–150μ thick, of bladed to fibrous, outward-growing crystals that bear rhombs at their terminations. The internal casts of the filaments are inward-growing equant and bladed crystals. X-ray diffraction analyses indicate that the crystals are magnesium calcite with 16 mol % $MgCO_3$.

The filaments remaining after decalcification are *Ostreobium* sp., a widely distributed boring green algae characterized by variations in diameter of the filaments from 1–20μ, by a lack of transverse partitions, and by local swellings of the filaments. Individual filaments show both the boring habit and incrustation with magnesium calcite.

Whether the outward-growing crust around the filaments is the result of vital activities of the alga, photosynthesis, or boring, and whether the filaments provide an active organic matrix or a passive substratum to localize calcification have not been determined yet. However, it is clear that this type of cementation is submarine and early diagenetic; hence, similar calcified filaments in ancient reefs provide a criterion for and measure of early diagenesis.

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CRETACEOUS LITHOCLASTS IN MODERN BEACH AND RIVER SANDS, VERACRUZ, MEXICO

Abundant Cretaceous carbonate lithoclasts have been found in modern volcanic beach and river sands between Tecolutla and Punta Delgada, Veracruz, Mexico.

The major rivers (Río Nautla and Río Misantla) drain a volcanic terrane which also has outcrops of Lower Cretaceous cherty micrite (Tamaulipas Formation). The stream sediments are composed primarily of volcanic rock fragments and quartz except just downstream from the carbonate outcrop where lithoclasts may make up 50% of the stream sediment. The lithoclast content then drops to 10% at the river mouth.

Micritic lithoclasts make up 35–60% of the beach sands, the rest being volcanic rock fragments and quartz. The lithoclast content increases irregularly from south to north, but drops to 20% or less at the river mouths. Volcanic rock fragment trends are opposite. Wind concentrates the lithoclasts in dunes and the upper beach backslope. The lithoclast percentage is directly proportional to grain size.

The lithoclasts probably were delivered to the coast at a time when the gradient was steeper and/or the climate drier. They are presently being mixed with volcanic debris brought in by the river system and a northward-flowing longshore current.

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GYPSUM—ENVIRONMENTAL INDICATOR IN EVAPORITES

Crystal habit and textural relations of early gypsum, or pseudomorphs after early gypsum, can provide useful indices of subenvironments of evaporite deposition. Attention is directed to the environmental significance of such features of the gypsum as crystal habit, primary versus replacement origin, free versus attached growth, mechanical force of crystal growth, and orientation.

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DELTAIC DEPOSITS OF UPPER PART OF DAKOTA FORMATION (UPPER CRETACEOUS), CENTRAL KANSAS

Sedimentary deposits within the upper 40–100 ft of the Dakota Formation exposed in Russell County, Kansas, record deposition in an environmentally diverse deltaic setting developed during the initial stages of the Greenhorn marine cyclothem. The lower two thirds or more of the Dakota (200–300 ft thick in central Kansas) consists predominately of nonmarine kaolinitic mudstone and discontinuous channel sandstone lenses; however, the upper part contains a complex of fluvial-deltaic, delta-plain and marginal-marine lithofacies, which grade upward into the shallow-water marine Graneros Shale. Such lithofacies have been mapped in detail and can be differentiated according to macroinvertebrate and trace-fossil assemblages, sedimentary body geometry and lateral depositional relations, sedimentary structures, and petrology.

The sedimentary complex in Russell County is dominated by an elongate fluvial-deltaic channel sandstone which changes within 30 mi from a highly meandering, trough-shaped fluvial sandstone body containing freshwater mollusks to a tabular-wedge shaped, delta-front sandstone body containing freshwater to brackish-water macroinvertebrates and a variety of trace fossil types. Kaolinitic floodplain deposits containing abundant plant fossils most commonly are laterally associated with channel sandstones; however, within the upper 20–30 ft of the formation, freshwater lignitic coal-swamp facies and freshwater to brackish-water sideritic clay-ironstone swamp facies are common. Locally, laminated to highly burrowed delta-marine and strandline marine sandstones are present. These contain a diverse association of marine macroinvertebrates and an abundance of trace fossil types. The deltaic facies grade upward into the fossiliferous, glauconite-rich marine sandstone and montmorillonitic shale of the Graneros.

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BUDGET OF CALCIUM CARBONATE SEDIMENTATION, SOUTHERN CALIFORNIA CONTINENTAL BORDERLAND

Although calcareous organisms are abundant in temperate waters of the southern California continental borderland, $CaCO_3$ is a relatively minor constituent of the sediments. Noncarbonate dilution provides only a partial explanation. Estimating rates of particulate $CaCO_3$ mass transfer to or from that