departure from solid/fluid equilibrium during diagenesis will increase with depth of burial if the pore fluid pressure is hydrostatic.

When mineral/fluid equilibrium is not reached, the mineral assemblage developed may be controlled by kinetic rather than thermodynamic factors. Solid phases not stable at the prevailing temperature and fluid pressure may form if high local solubilities create supersaturation in the bulk fluid with respect to many solids. The growth of minerals which decreases the total supersaturation rapidly is favored. Hence, fast-growing less-stable phases (for example, clays, zeolites, and aragonite) may form or persist at the expense of more stable but more slowly forming phases (i.e., illite, feldspars, and calcite). Consequently, the influence of both kinetic factors and bulk phase equilibrium should be considered in evaluating the genesis of mineral assemblages formed during diagenesis and burial metamorphism.

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Calcite Cement Recognition—Fact or Fantasy

The features characteristic of competitive growth such as plane intercrystalline boundaries, and increasing crystal size away from the substrate, together with the high frequency of enfacial junctions are regarded by others as intrinsic to cements and form the mainstay of its identification. The features of competitive growth are based on published crystal growth diagrams which are unrealistic because of gross oversimplification. The high frequency of enfacial junctions, claimed as the least unequivocal criterion for cement recognition, still requires explanation. The jerky growth required by cessation of one crystal's face while others grow against it seems unnatural.

Three new diagrams for specific calcite crystallographic forms ($(10\bar{1}1)$, $(40\bar{4}1)$, and $(01\bar{1}2)$ rhombohedra) are introduced. These show competitive or impingement aggregates developed through 3 or 4 maturation stages, and occuring in two basic types, one in which the crystals develop positive elongation, and the other in which negative elongation develops. These graphic models find their closest natural analog in parallel-side veins, but their properties can be applied to pore-fill cements which grew by seeding (without epitaxy) onto the pore walls.

The apparent enigma between the absence of enfacial junctions in the new diagrams and the high recorded frequency in natural aggregates is explained by reference to selected examples.

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Role of Multiple-Headed Submarine Canyons, River Mouth Migration, and Episodic Activity in Generation of Basin-Filling Turbidity Currents

The initiation mechanism and source of turbidite sediments to fill both recent and ancient offshore basins can be explained by examining nearshore submarine canyons like those off the Magdelline River, Columbia, and Rio Balsas, Mexico. To generate turbidity currents, large amounts of sediments of mixed grain size must first be stored as a stable deposit in the upper reaches of a canyon, then some mechanisms must create instability and set the entire deposit into motion. Canyons which head at deltas respond to the pulsating sources of sediment and the migration of the river mouth from one area to another. There is a flip-flop in the processes active in the canyon heads from one of erosion when the head is proximal and a large amount of coarse sediment enters directly into the canyon, to one of deposition of fine-grained sediment when the canyon head is distal and processes quiescent. During the distal stage, fine-grained cohesive sediments build up forming V-shaped profiles. The walls literally grow together. The migration of the river mouth back to the vicinity of a formerly quiescent distal canyon head will introduce coarse-grained sediments and reinitiate submarine erosion of the poorly consolidated canyon fill. Erosion forms steep unstable slopes and progressive slumping, creating the mechanism for generating a turbidity current with a large volume of poorly sorted driving sediment.

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Blake Escarpment Carbonate Platform Edge: Conclusions Based on Observations and Sampling from Research Submersible

Three continuous transects of the Blake Escarpment, east of Florida, were made during 10 dives in the submersible Alvin at depths from 1,400 to 4,000 m. We observed and sampled outcrops of horizontal strata known, from multichannel profiles across the dive sites, to extend westward beneath the Blake Plateau carbonate platform. The northern end of the Blake Escarpment, at the salient of the Blake Spur, is a nearly vertical limestone cliff, which is pitted and commonly fluted by vertical borings, coated by ferromanganese oxide, and heavily encrusted by organisms. Presumably, the cliff face is maintained by bioerosion and corrosion, and debris is removed by the strong turbulent currents (2 kn). Average slopes were less steep at transects 130 and 200 km south of the Blake Spur, but vertical cliffs as much as 450 m high exist. Talus slopes are common, and the large blocks and landward dips of beds suggest collapse of fragments at least several hundred meters across. On the southern transect are broad slopes of rippled pteropod sand between near-vertical outcrops; a vertical 160-m cliff of massive limestone at the top of the escarpment and rudists in talus blocks suggest the presence of a Mesozoic reef. Preliminary analysis of calcarenous nannofossils shows rocks as old as Early Cretaceous; identification of older rocks is anticipated. Sedimentary structures and components indicate deposition in shallow water. Thousands of meters of subsidence and extensive erosional retreat were required to create the escarpment's present configuration.

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Field Study of Subaqueous Avalanching

Many submarine canyon walls consist of unconsolidated sand sitting at the angle of repose ($\sim 31°$). The sand walls commonly maintain this slope for many tens of meters before leveling out at the canyon bottom. Where such angle-of-repose sand slopes occur within scuba diving depth, they present an opportunity to study subaqueous grain flows in situ. Such a study has been conducted in the head of Carmel submarine canyon, Carmel Bay, California.