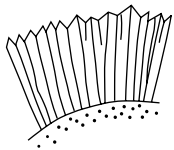
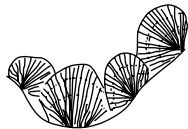


**Acicular:** Needle-like crystals, growing normal to the substrate. Crystals elongated parallel to the  $c$ -axis, exhibiting straight extinction. Terminations are pointed or chisel-shaped, twinning is common. Width  $<10\ \mu\text{m}$ , length to about  $100\ \mu\text{m}$  and more. Commonly forming isopachous crusts. Predominantly aragonite, but also Mg calcite. Marine phreatic.



**Fibrous:** Fibrous crystals, growing normal to the substrate. Crystals show a significant length elongation, usually parallel to the  $c$ -axis. Crystal shape is needle-like or columnar (Length to Width ratio  $>6:1$ , Width  $>10\ \mu\text{m}$ ). Size commonly fine to medium crystalline. Commonly forming isopachous crusts; common in inter- and intra-particle pores. Aragonite or high Mg calcite. Mostly marine phreatic, but also meteoric vadose and marine vadose (columnar crystal shape). Syn.: Radial fibrous.



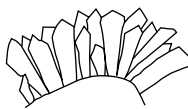
**Botryoidal:** Pore-filling cement made of individual and coalescent spherules that range in size from tens of microns to several centimeters. Spherules consist of individual and compound fans which are themselves composed of elongated euhedral fibers with a characteristic sweeping extinction in cross-polarized light. Spherules exhibit discontinuous, concentric dust bands. Aragonite (calcite in caves). Usually marine and common in cavities of reefs and steep seaward slopes, but also known from caves and burial environments, Syn.: Spherulitic.



**Radiaxial fibrous:** Large, commonly cloudy and turbid, inclusion-rich crystals with undulose extinction. Size medium to coarse crystalline, rarely extending several millimeters in length, commonly about  $30\text{--}300\ \mu\text{m}$ . Crystal length/width ratio  $1:3$  to  $1:10$ . Crystals show a pattern of subcrystal units. Within each subcrystal that diverges away from the substrate an opposing pattern of distally convergent optic axes occurs, caused by a curvature of cleavage and twin lamellae. Undulose extinction of subcrystals or subcrystal units is used in distinguishing subtypes. Commonly forming isopachous crusts. Calcite. Marine phreatic and burial.



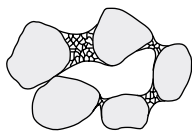
**Dog Tooth:** Sharply pointed acute or rarely blunted calcite crystals of elongated scalenohedral or rhombohedral form, growing normal and subnormal to the substrate (grain surface or atop earlier cements). Crystals are a few tens to a few hundred microns long. Calcite. Commonly meteoric and shallow-burial but also marine-phreatic and hydrothermal. Syn.: Bladed scalenohedral cement, bladed prismatic cement, dentate cement, scalenohedral cement.



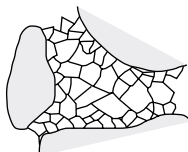
**Bladed:** Crystals that are not equidimensional and not fibrous. They comprise elongated crystals somewhat wider than fibrous crystals (length/width ratio between  $1.5:1$  and  $6:1$ ) and exhibiting broad flattened and pyramid-like terminations. Crystal size up to  $10\ \mu\text{m}$  in width and between less than  $20$  and more than  $100\ \mu\text{m}$  in length. Crystals increase in width along their length. Commonly forming thin isopachous fringes on grains. Commonly high-Mg calcite but also aragonite. Marine phreatic (abundant in shallow-marine settings) and marine vadose.



**Dripstone:** Pendant cement characterized by distinct thickening of cement crusts beneath grains or under the roofs of intergranular and solution voids. The cement forms on droplets beneath grains after the bulk of the mobile water has drained out of the pores, leaving a thicker water film at the lower surface of the grains. Forms typically gravitational, beard-like patterns. Predominantly calcite. Formed above the water table with the meteoric vadose zone (where it is commonly associated with meniscus cement) but also found in marine vadose zone (beachrocks and intertidal and supratidal crusts) where it is aragonite. Syn.: Gravitational cement, microstalactitic cement, microstalactitic drusy cement, stalactitic cement, aragonite dripstone cement.



**Meniscus:** Cements precipitated near grain-to-grain contacts in pores containing both air and water. Exhibits curved surfaces due to meniscus formed by surface tension. Calcite. Characteristically zoned in the meteoric-vadose zone, but may also occur in vadose-marine beachrocks.



**Drusy:** Void-filling and pore-lining cement in intergranular and intraskeletal pores, molds, and fractures. Characterized by equant to elongated, anhedral to subhedral crystals. Size usually  $>10\ \mu\text{m}$  with crystal size increasing towards the center of the void. Non-ferroan calcite. Near surface meteoric as well as burial environments. Syn.: Drusy calcite spar mosaic, drusy equant calcite mosaic.

FIGURE 19.8. Types of carbonate cement. Modified from Flügel (2004). Springer-Verlag © used by permission.