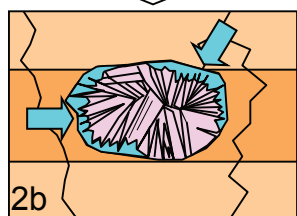
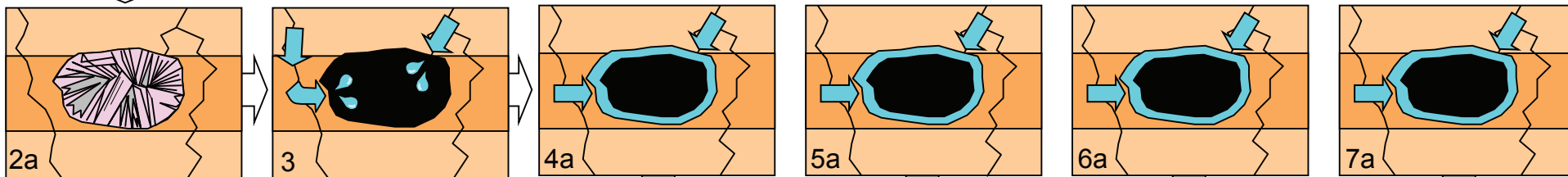
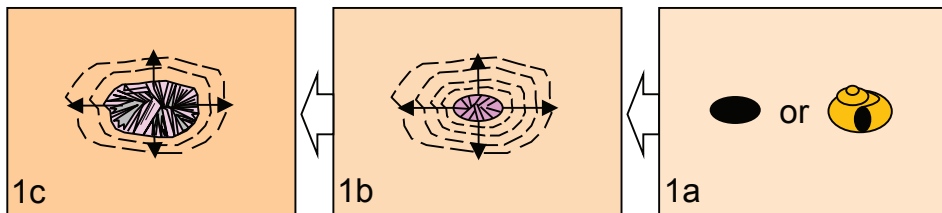
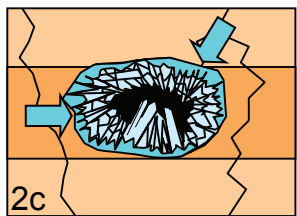


# How geodes and agates form

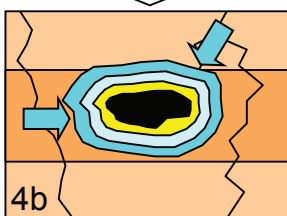
(1a-c) Geodes and agates usually begin as void spaces in sediment or as dissolved organic remains. Evaporite minerals such as anhydrite fill the void and expand in sediment to form a nodule.



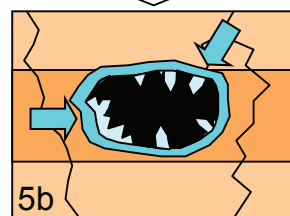
(3) Anhydrite nodule dissolves. Silica-rich water percolates into the void through tiny fractures or pores in the sediment or rock. Changes in chemistry (eH, pH) between the void and the matrix around the void cause silica-rich gels to precipitate along the margin of the void. Once silica precipitates, it forms a chalcedony (type of quartz) rind along the inside of the void.



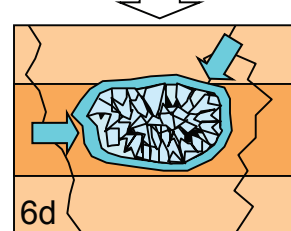
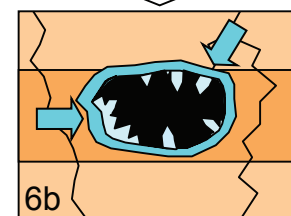
(2a-c) Silica-rich water percolates through the bedrock and replaces the anhydrite crystals, leaving a quartz geode or nodule.



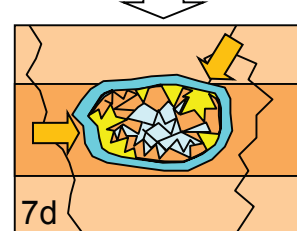
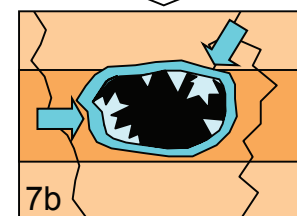
(4a-c) Void fills with successive layers of silica gel (quartz), some with minor mineral impurities, one on top of the other, to form a **banded agate**.



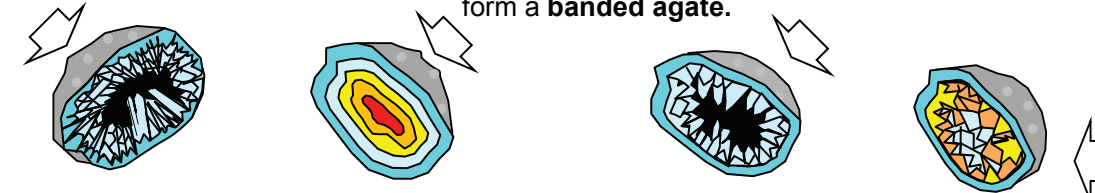
(5a-c) Quartz crystals grow inward from the initial rind and partially fill the space to form a **quartz geode**.



(6a-d) If the void space is completely filled with quartz, a solid quartz **nodule or concretion** is formed.



(7a-d) Different fluids can fill the void at different times to form geodes or nodules with a variety of mineral fillings.



Because quartz is a hard and resistant mineral, the agate, geode, or concretion can be eroded from the bedrock to be found in a stream or sediment