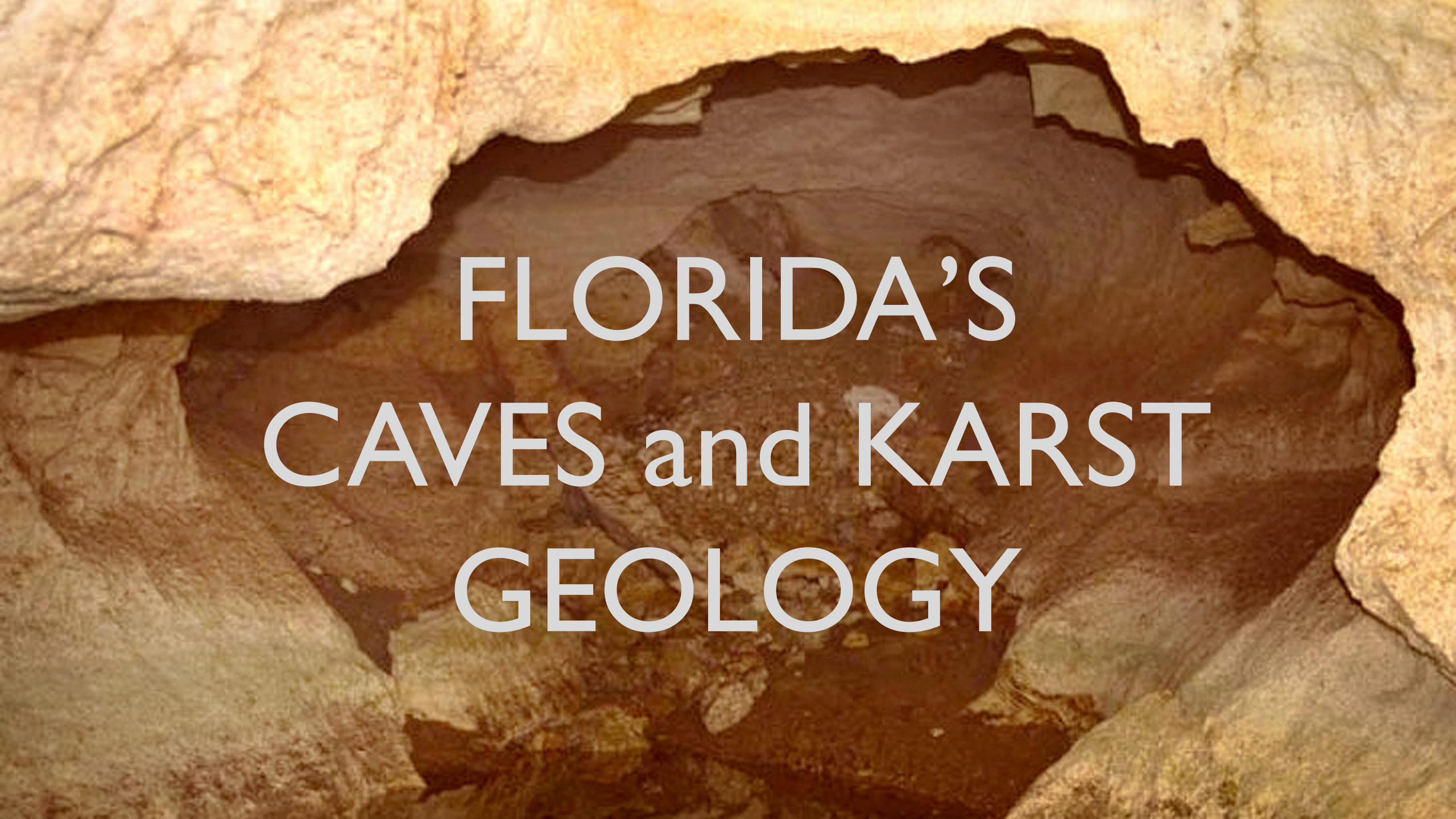
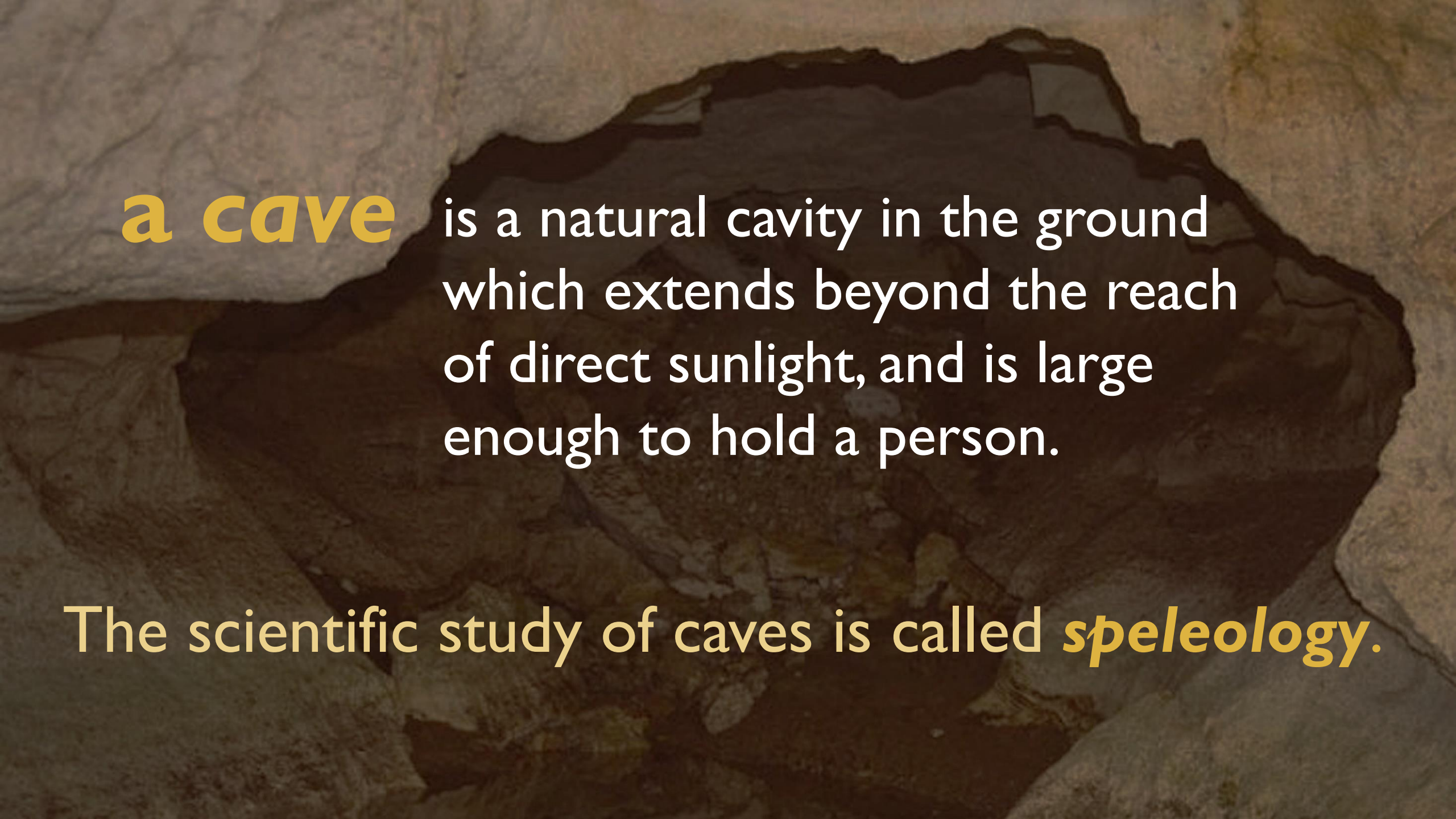

FLORIDA'S
CAVES and KARST
GEOLOGY



a *cave* is a natural cavity in the ground which extends beyond the reach of direct sunlight, and is large enough to hold a person.

The scientific study of caves is called ***speleology***.

There are two main *types of caves:* ***PRIMARY*** and ***SECONDARY.***

Primary Caves are formed *at the same time as* the surrounding rock is forming. *Lava caves (or tubes) are the most common primary caves.*

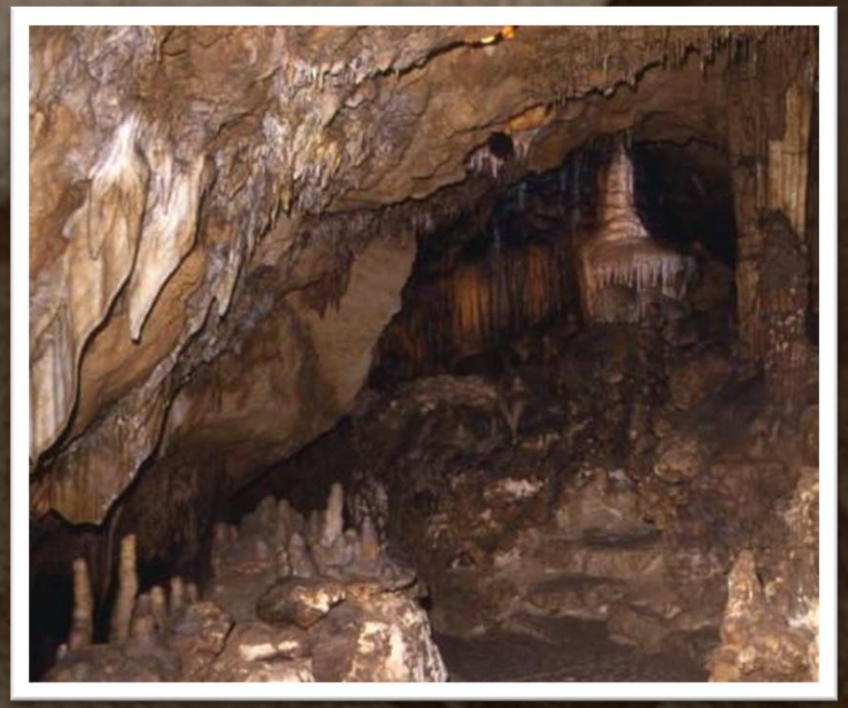
lava cave - Lava River Cave, Coconino National Forest, AZ (NFS image)

sea cave - Golden Gate National Recreation Area, CA (NPS image)

talus (boulder) cave - Pinnacles National Park, CA (NPS image)

glacier cave - Larsbreen Glacier, Svalbard, Norway (AGU image)

Secondary Caves are formed by processes such as dissolution and erosion of the surrounding rock, *after* the rock has already solidified. *Most caves are secondary.*

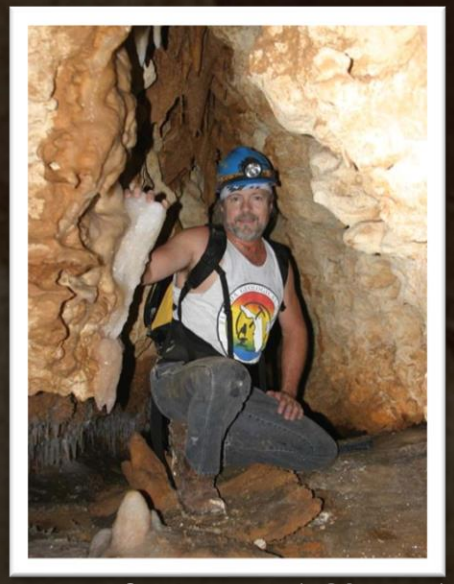


solution cave - Marianna Caverns, Florida Caverns State Park (FL Archives image)

solution caves (or *karst caves*) (like the replica at the Gillespie Museum) are also **Secondary Caves**, and ***the most common type of cave.*** They are formed from the dissolution of soluble rock, and often contain cave formations.

Most **SOLUTION CAVES** occur in ***carbonate rocks*** (such as limestone or dolostone – *as here in Florida*), or in ***evaporite rocks*** (such as gypsum or halite).

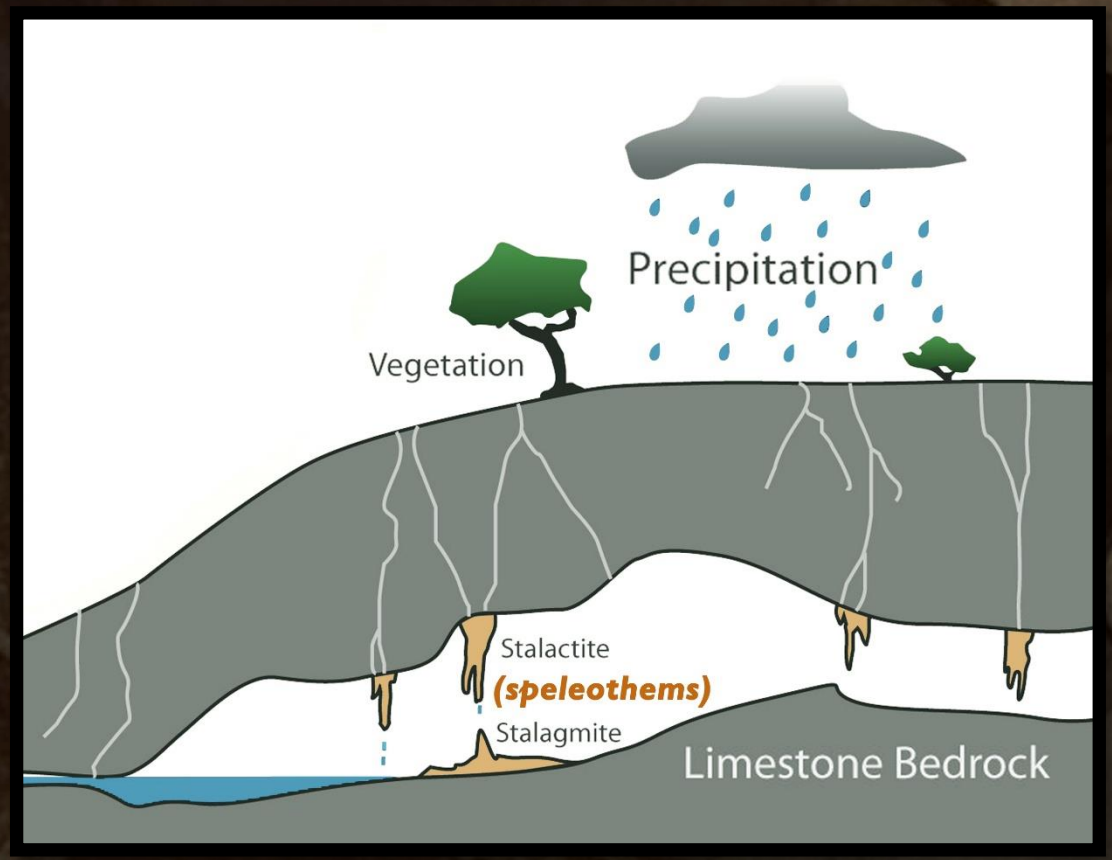
Cave, Lecanto, Florida (Florida Geological Survey image)



Trawick Cave, Florida (FGS image)

Slowly moving, slightly acidic groundwater dissolves the underground rock, forming tunnels, passages, cavities, and chambers as it seeps through cracks and fissures, and fills other openings in the rock layers.

After a **limestone solution cave** drains and fills with air (from a lowering of the local water table), the continuing seep of groundwater through the soluble rock and into the open cavities can deposit calcium carbonate ($CaCO_3$ *usually in the form of calcite*) as **cave formations**, or ***speleothems***.



Speleothem Formation (Climatica.org.uk image, *with alterations*)

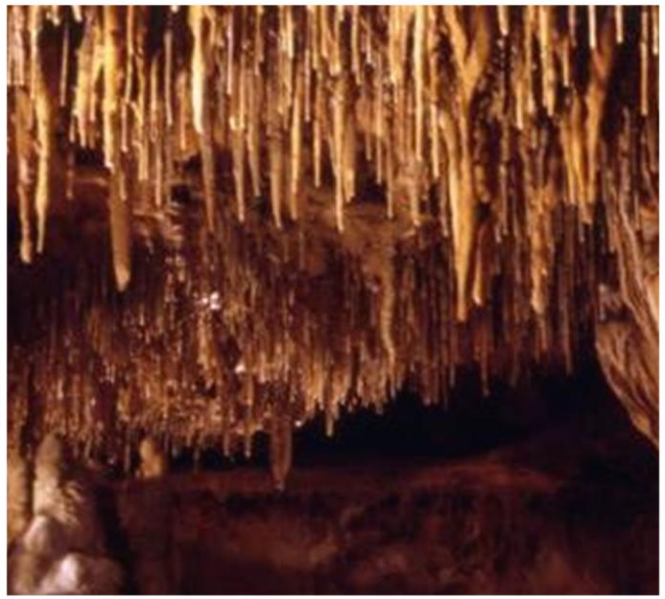
Speleothems (or ***cave formations***)

can be divided into four categories, *based on how water, saturated with dissolved calcium carbonate, enters and moves in a cave*—whether it **drips** or **seeps** from walls or ceilings, **flows** along surfaces, or forms **pools**.

DRIPSTONE ***PORE DEPOSITS***

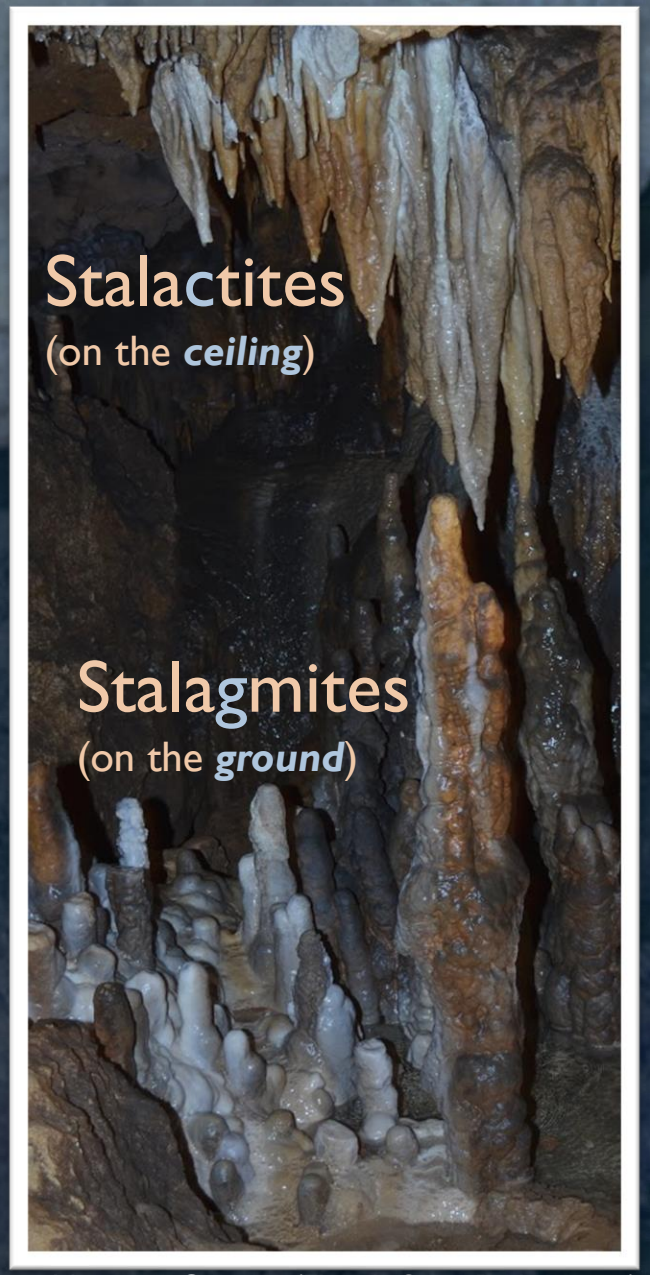
FLOWSTONE ***POOL DEPOSITS***

DRIPSTONE formations are created by ***dripping*** water, falling in small drops from the roof of a cave, leaving behind deposits of calcium carbonate.



Straw formations, Marianna Caverns, Florida
(Florida Archives image)

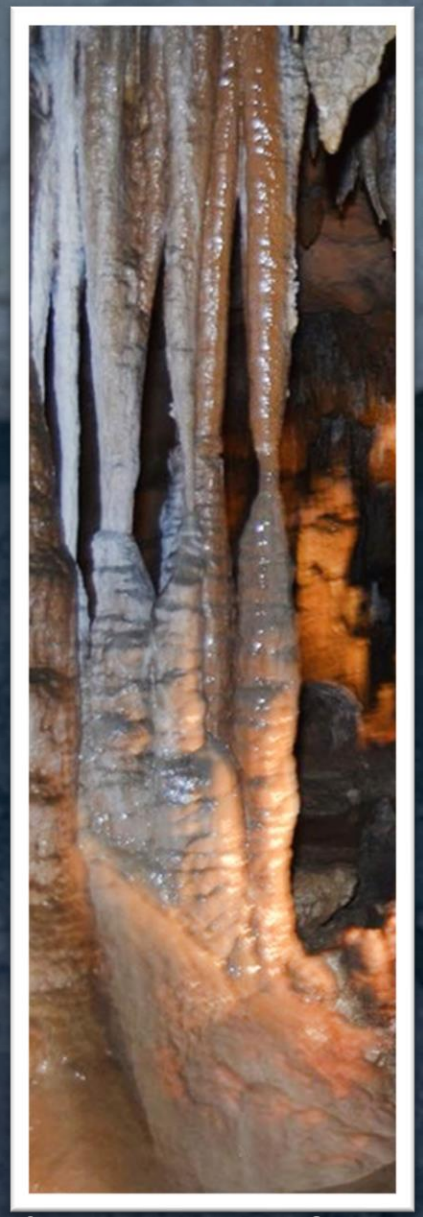
Straws are thin hollow forms of *dripstones*, which begin with small, microscopic rings of calcite crystals.



Marianna Caverns (Florida State Parks image)

Stalactites are also *dripstones*. They grow from cave ceilings—as straws first—developing and thickening over time, as solution runs down their outer surfaces.

Stalagmites are solid *dripstones*, growing upwards from a cave floor.



Stalagnates, Marianna Caverns
(Florida Archives image)

Stalagnates, also known as ***pillars*** or ***columns,*** are formed when stalactites and stalagmites meet—the late stage of *dripstone* development.

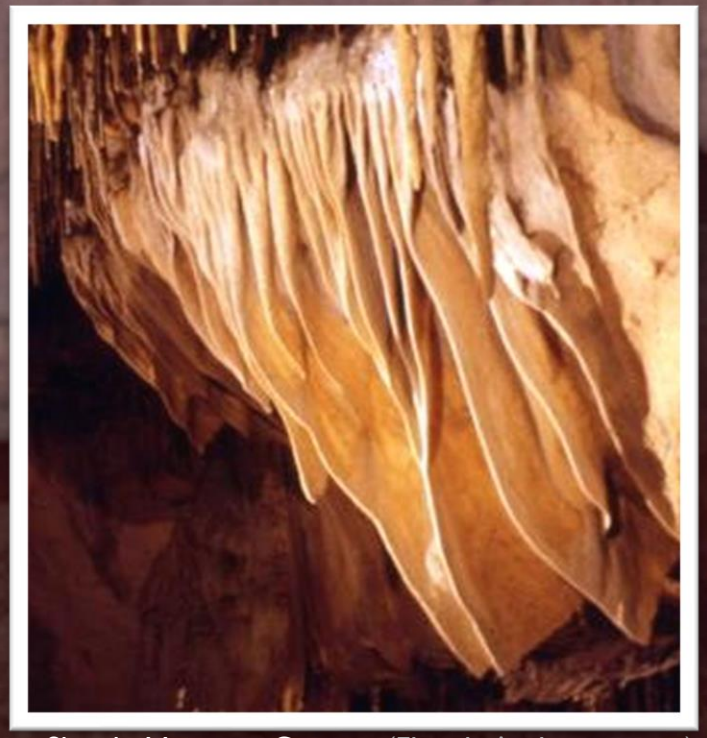
Calcite flower, Lecanto, Florida
(Tom Scott image)

Calcite flowers form when dripping water splashes, creating crystals as the water evaporates.

FLOWSTONE formations are created by water ***flowing*** down the walls or over the floors of a cave, building up layers of calcium carbonate.

Flowstone, Marianna Caverns (Florida State Parks image)

Flowstone develops as thin layers of calcite build on each other, forming thick, rounded deposits on walls and floors.

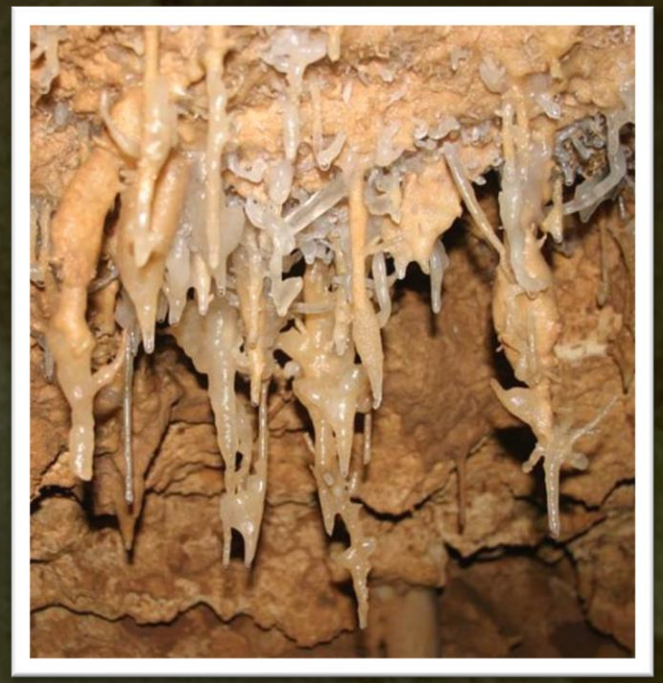


Shawls, Marianna Caverns (Florida Archives image)

Shawl formations, Sequoia Kings Canyon (NPS image)

Shawls are a variety of *flowstone* that forms where trickles of water down a rockface deposit narrow strips of calcite that build up, forming thin sheets at an angle to the wall. Also called ***draperies*** or ***curtains***, they often have wavy folds and colored banding.

PORE DEPOSITS develop when water slowly ***seeps***—rather than drips or flows—into caves, through pores and fractures in the rock.



Helictites, Trawick Cave, Florida
(Florida Geological Survey image)

Helictites are calcite *pore deposits* of twisted and curving capillary tubes, formed by capillary forces and varying wind currents.

Helictites, Lecanto, Florida
(FL Geological Survey image)

Cave popcorn, Wind Cave (National Park Service image)

Cave coralloids, or popcorn, Wind Cave, South Dakota (NPS image)

Cave coralloids, or ***cave popcorn***, are *pore deposits* that develop as knobby, globular layers of calcite nodules, rather than as capillary tubes.

POOL DEPOSITS form where water is able to collect and ***pool*** in cave floors.

Dogtooth spar calcite, Lecanto, Florida
(Florida Geological Survey image)

Dogtooth spar is a crystalline calcite *pool deposit* formed under very still conditions, where super-saturated solution can create large crystal faces and perfect forms.

Rimstone dams, or ***gours***, are vertical walls that build up as cave pools overflow, depositing calcite at the edges. Rimstone *pool deposits* can create extended terraces across sloping cave floors.

Rimstone dams, Marianna Caverns, Florida (Florida State Parks image)

Water-level crystals, Lecanto, FL (Tom Scott image)

Water-level crystals, Lecanto, Florida (Tom Scott image)

Bottlebrush, Lecanto, FL (Tom Scott image)

Water-level crystals (*shelfstones*) are *pool deposits* that grow in and around the edges of cave pools or around existing dripstones, in still water and at a constant pool level. A ***bottlebrush*** form results when a stalactite is covered by rising water, and overgrown with dogtooth spar.

Water-level crusts, Lecanto, Florida (Tom Scott image)

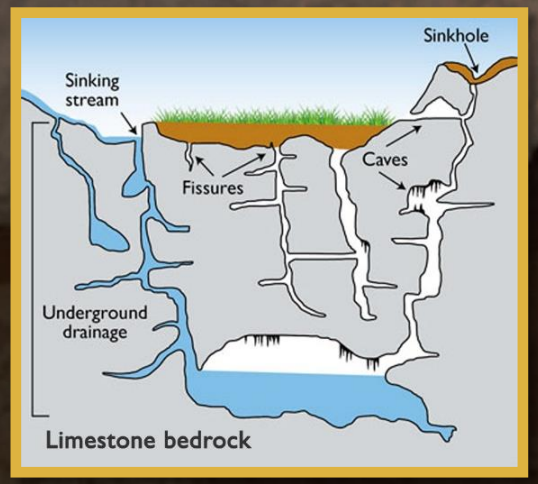
Water-level crusts (*calcite rafts*) are sheet-like *pool deposits* formed when mineral-rich dripwater hits a pool surface, depositing its mineral content as a thin layer.

Cave pearls in basins (FL Geol. Survey image)

Cave pearls are spherical *pool deposits*, with calcite forming around a seed crystal or tiny grain of sand.

karst

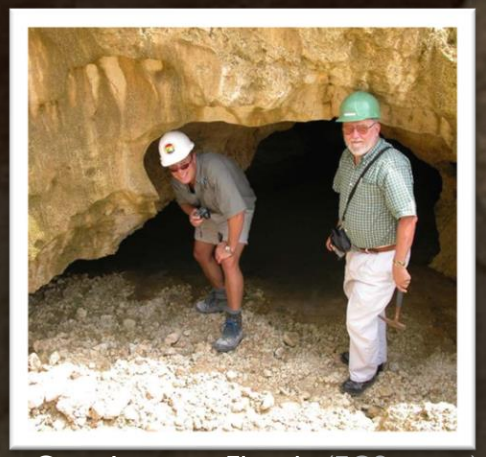
is a type of landscape formed by **the dissolution *(dissolving)* of the underlying limestone**—or other soluble rock. Karst is characterized by ***sinkholes, springs, caves, and underground streams.***



Karst Features (Cornell University image)

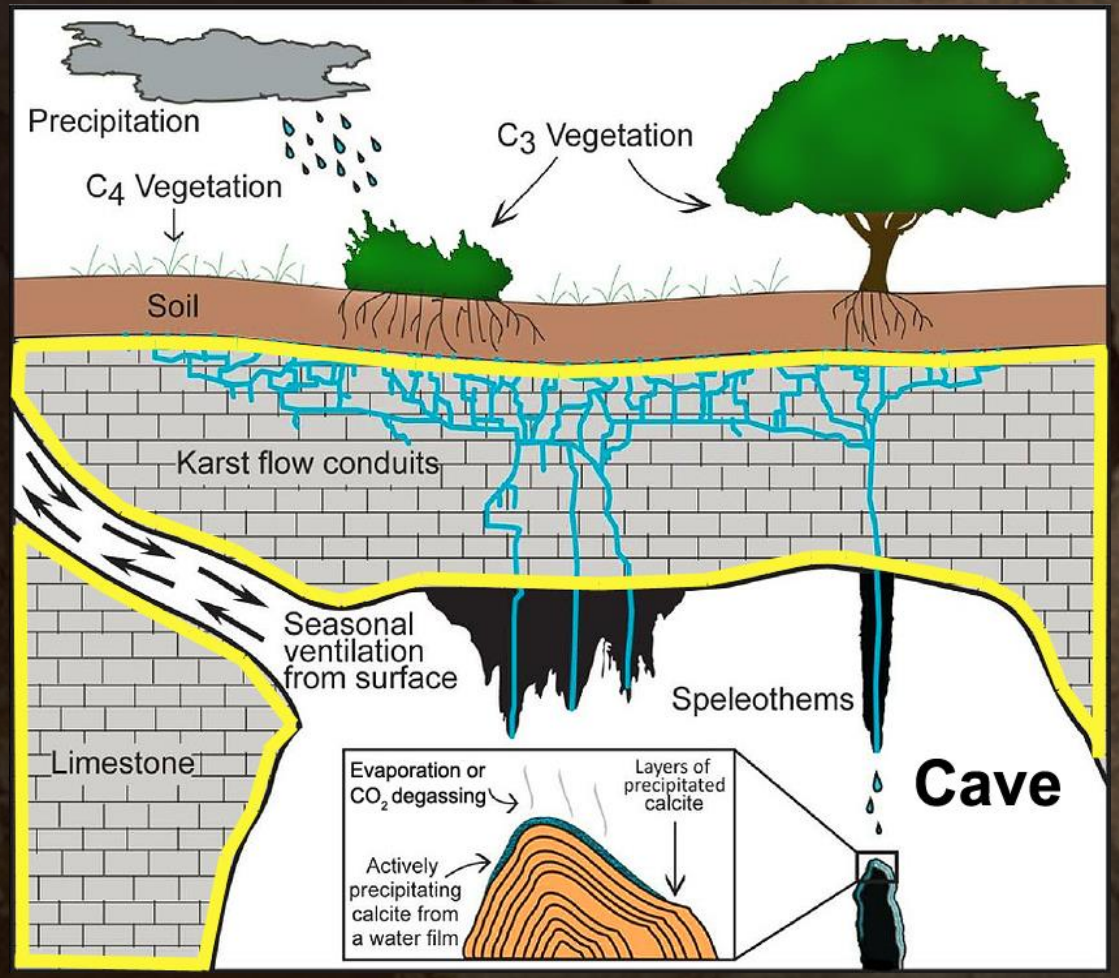
Suwannee River karst (SRWMD State of Florida image)

Olsen Sink, Peacock Springs State Park, Florida (Suwannee County image)



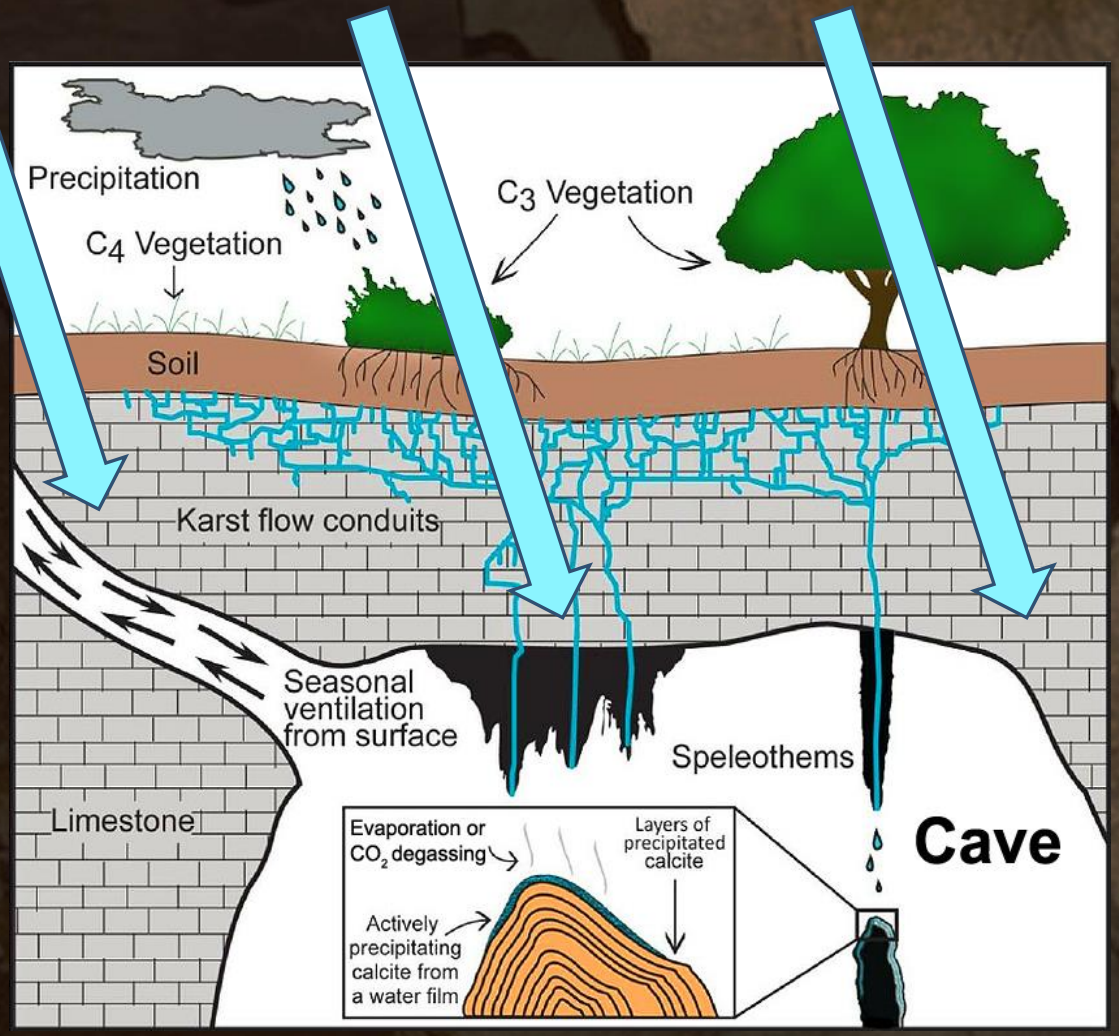
Cave, Lecanto, Florida (FGS image)

Florida is underlain with **carbonate rock**, *mostly* ***limestone and dolostone***, which can easily dissolve in weakly acidic groundwater.



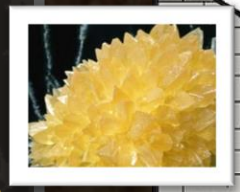
Karst Landscape and Speleothem Formation (Meyer, Breecker, Banner, & Guilfoyle 2011)

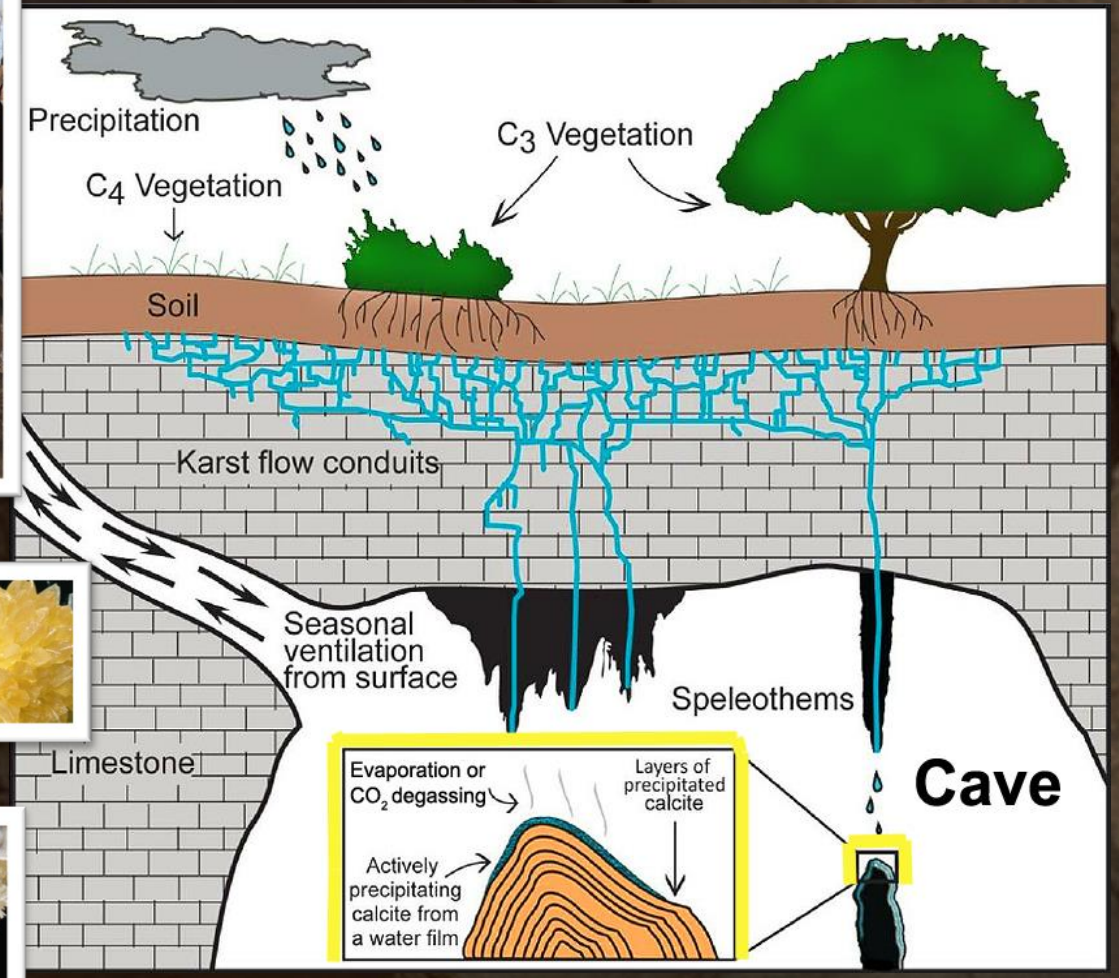
Rainfall absorbs carbon dioxide (CO_2) and other compounds from the atmosphere and soil, becoming slightly acidic. As it seeps underground, this weakly acidic groundwater dissolves the **calcium carbonate** ($CaCO_3$) in the rock, enlarging pores and fissures, resulting in various ***karst features***, such as caves.



Karst Landscape and Speleothem Formation (Meyer, Breecker, Banner, & Guilfoyle 2011)

When the groundwater encounters air-filled cavities in the bedrock, $CaCO_3$ can be precipitated back out of solution in two main ways: ***evaporation*** (in dryer caves), creating most speleothems; or ***CO_2 degassing*** (wet caves), creating deposits of larger, translucent calcite crystals.





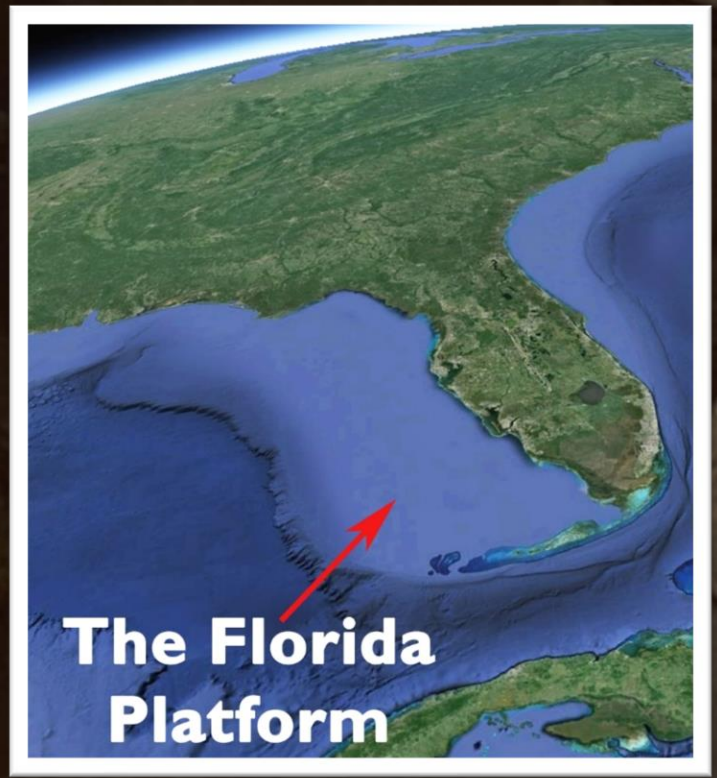
Karst Landscape & Speleothem Formation (Meyer, Breecker, Banner, & Guilfoyle 2011)

Paleogeographical Map of North America, 50mya (Ron Blakey, NAU)

Florida's **soluble limestone bedrock**, which allows for the formation of **caves** and other **karst features**, and provides the calcium carbonate and calcite for the growth of **cave formations** (*speleothems*), was created by 200 million years of carbonate rock deposition during periods ***when Florida was largely underwater.***

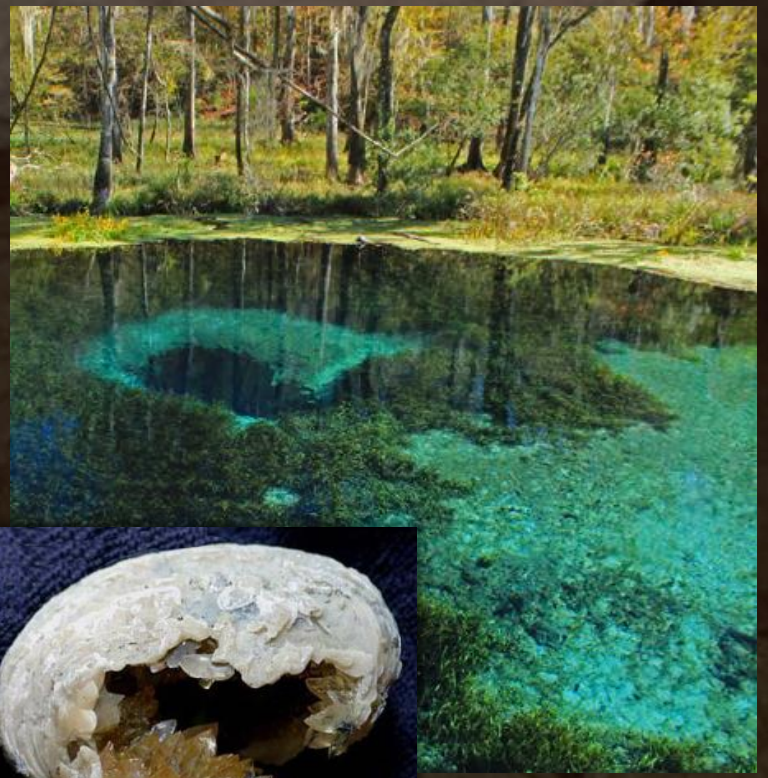
This **carbonate rock "platform"** (*the Florida Platform*) accumulated on ***a segment of 500-million-year-old African-formed basement rock,*** after it moved north and became fused with the North American Plate.

Location of Florida Landform, 500mya (from *Roadside Geology of Florida*, Bryan, Scott, & Means, 2008; Kosche)



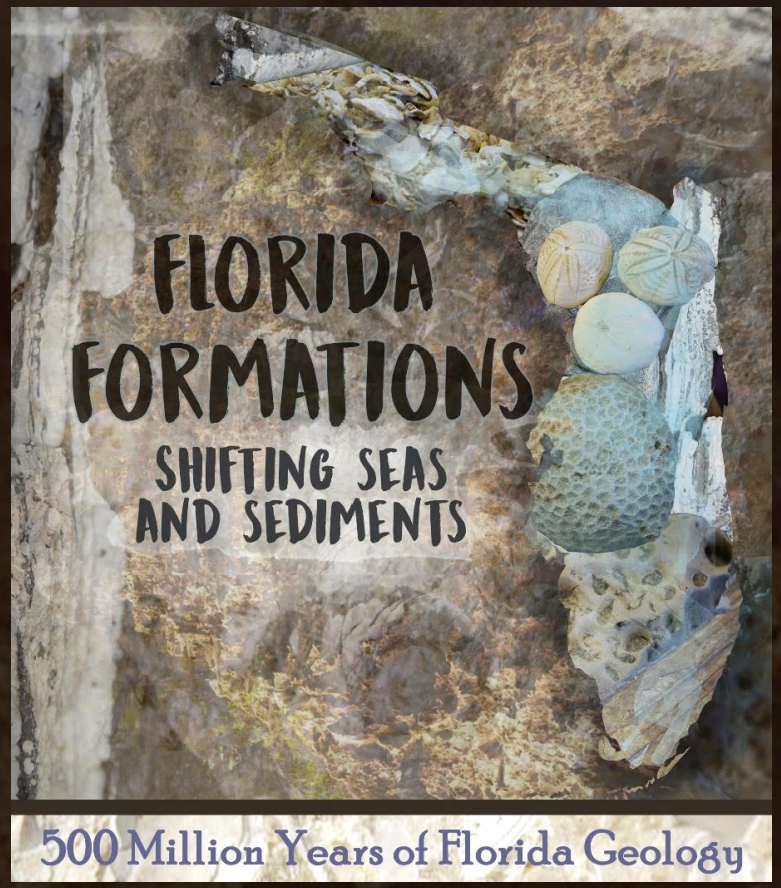
Landsat image of Florida Platform (Google Earth)

For more on Florida's fascinating geological history see our *Florida Formations* exhibit.



Blue Hole Spring, Suwannee County (USGS image)

Fossilized surf clam with calcite, Okeechobee County (FGS image)



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Coquina limestone, Washington Oaks Gardens State Park, Flagler County (Tanner image)

Cape San Blas dunes, St. Joseph Peninsula State Park, Gulf County (Tanner image)