Teachers Fact Sheet No 4
Cave Formation

There are several different kinds of caves, including solution caves, primary caves, sea caves, and glacier caves.

Primary caves

Primary caves are formed at the same time as the surrounding rock. An example of this is a lava tube. Instead of dissolving rock, a lava flow will slowly solidify over itself and create a tube. Once the lava flow stops, the lava in the tube drains out, leaving behind the tube. The Undara Lava Tubes in northern Queensland were formed some 190,000 years ago and have around 100km of passages.

Sea caves

A sea cave is formed by the mechanical process of ocean waves hitting and eroding a weakened cliff-side rock.

Glacier caves

Glacier caves are formed within a glacier. Water finds its way inside a glacier and melts the ice from within. Air movement can then help enlarge the cave. Another way that glacier caves are formed is through geothermal heat from volcanic vents, melting the ice and creating a hole.

Solution Caves

The process of cave development in soluble rock is very slow. It all begins with rain.

As cold rainwater falls through the atmosphere it absorbs oxygen and carbon dioxide in the air. When the rain finally reaches the forest floor it begins to seep through decaying forest mulch and leaf litter, absorbing **humic acid**, a complex mixture made up of many different acids, and additional carbon dioxide absorbed from the soil, which forms another weak acid called **carbonic acid**, $CO_2 + H_2O <=> H_2CO_3$. The decay of organic plant material in the soil produces high concentrations of CO_2. While surface air contains just 0.03%, the air within the soil may comprise up to 25% CO_2. As rainwater percolates through the soil more CO_2 gas is dissolved into the water, dramatically increasing the concentration of the carbonic acid.

As this solution of weak acids percolates through stress fractures and crevices, it dissolves the soluble limestone or dolomite and forms cavities and channels as it moves laterally and downward. Underground streams wash away any rock and sand deposits, causing physical erosion which adds to the formation of the cave.

The rate of dissolution of limestone is highly influenced by factors such as:

- temperature
- CO_2 content of the water
- volume of water
- water turbulence
- time in contact with the rock
- presence of other reactive ions in the solution.

Solution caves are also formed when the rock is under the water table. The solution cave will drain once the water table falls.

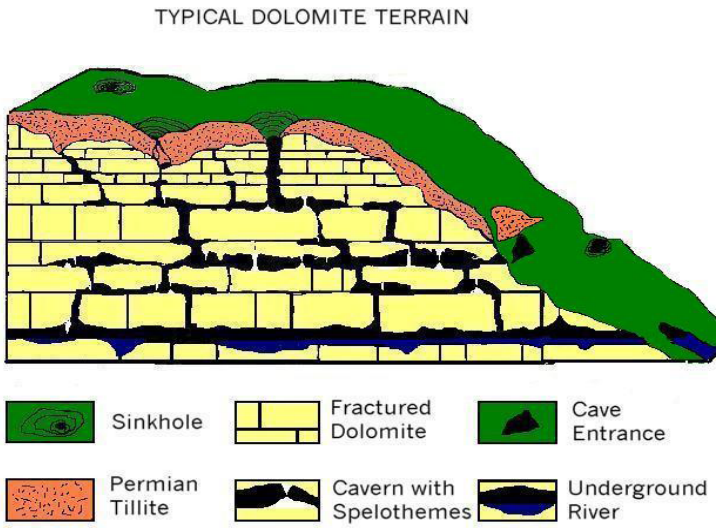
After thousands – and sometimes millions – of years of solution, passageways and caves are formed. An underground stream or lake may later develop as smaller cavities join, causing more erosion and roof collapse through undermining.

Because the dissolution of limestone and dolomite takes place under the surface, a cave may not have an obvious entrance on the surface, although there is often an exiting stream way where the percolating water arrives at the water table or at an underlying layer of impervious rock. Most surface entrances are created after a cave is formed.

A valley enlarging through river or glacial action (as is thought to be the case at Newdegate Cave) may create entrances as sections of the cave on the side of a hill are exposed.

Alternatively a collapsing cavern underground, sometimes following an earthquake, may cause a **sinkhole** or even a **gorge**, or the intrusion of quarrying on the surface may expose a cave system.

The term **karst**, from the Slav word *kras* meaning crag or stone, is used to describe any rocky limestone region. Karst terrain is generally characterised by bare rocky ground, sink holes, gorges, underground rivers and the absence of surface streams and lakes.



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These pages were created by the 8th grade members of the Raymondville Stream Team as part of their water quality research.

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