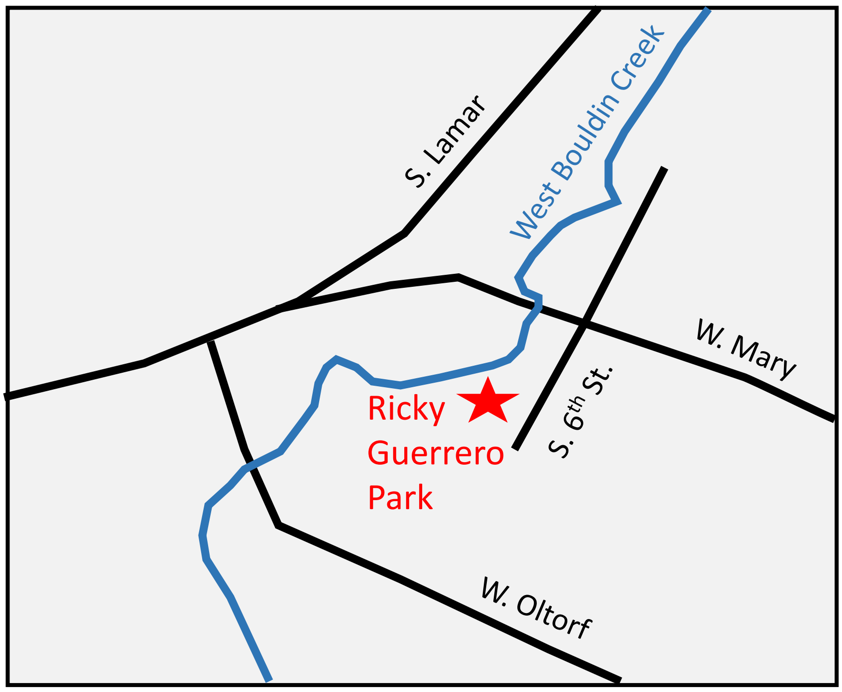
Austin Chalk Do It Yourself Field Trip –Ricky Guerrero Park

Austin Chalk Overview

The Austin Chalk is a white to gray limestone that can be seen from Dallas to west of San Antonio (https://en.wikipedia.org/wiki/Austin_Chalk https://mrdata.usgs.gov/geology/state/sgmcunit.php?unit=TXKau%3B0) as part of the Balcones Fault Zone (https://www.beg.utexas.edu/geowonders/centtex). It was deposited from about 90 to about 85 million years ago during the Cretaceous period. Below the surface, it extends across large areas of eastern Texas and Louisiana where it forms an important oil and gas reservoir in places (https://austinchalkoilgas.com/). The Austin Chalk is a formation that includes two main types of rock: chalk and marl. Chalk is a limestone composed of microscopic plankton fossils, so it formed in an ocean environment. Chalk is dominated by the calcium carbonate mineral calcite. Marl is a mixture of calcite, clay, and silt. Clay and silt are grains of quartz and other silica-based minerals. The chalk formed directly from living organisms in the ocean and the marl formed where clay and silt from the land was mixed into the chalk by rivers and storms.

Ricky Guerrero Park

This park has an interesting outcrop of Austin Chalk in the bed of West Bouldin Creek. Starting from the northwest corner of the park, one can walk along the creek bed for 0.14 miles where the outcrop ends at a railroad trestle.



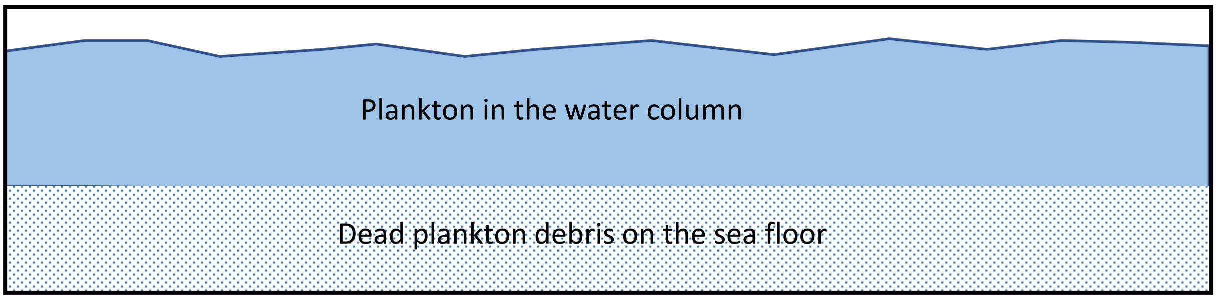
Interesting Things To See

This photo shows the bed of West Bouldin Creek at the northwest corner of the park. The lower part of the outcrop is very smooth, and it is overlain by a thin bed that looks rougher and more complicated. These two parts are separated by a surface that shows evidence of erosion. The Austin Chalk here does not show much layering because, before the chalk solidified into rock, animals burrowed into the soft sea bottom so they could live and feed there. Their activity mixed the sediment, so the original laying was destroyed.

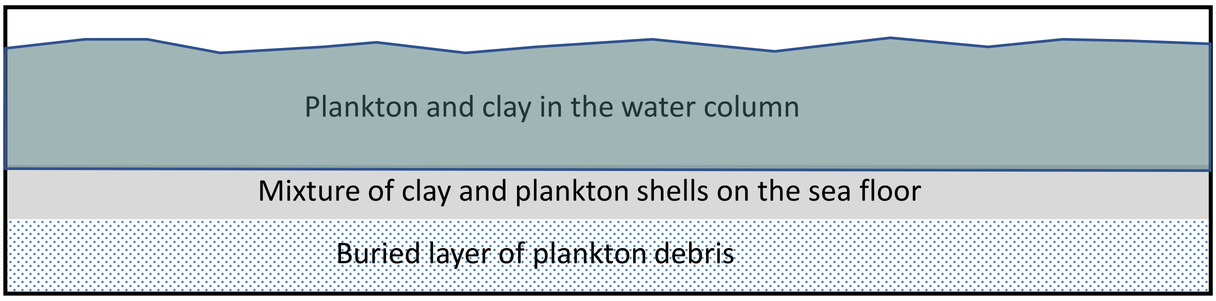
This photo is of the lower part of the outcrop and one can observe two shades of grey with narrow, linear patches of white. One shade of grey covers the lower part of the photo, and a lighter shade covers the upper part. The white patches are chalk-filled animal burrows that geologists call “trace fossils”. If you look closely into the darker grey part of the photo, you will see that the areas surrounding the chalk-filled burrows have linear patches of darker material that are older burrows. You can see how the white burrow fills cut across the grey burrow fills proving that the chalk-filled burrows are the youngest set. Now that you have made these observations, you can ask some interesting questions. The pocketknife is about 2-1/2 inches long.

Why are the burrow fillings two different colors? Why does the lower bed have patches of light and dark grey coloring? How did the surface at the top of the lower part of the outcrop form?

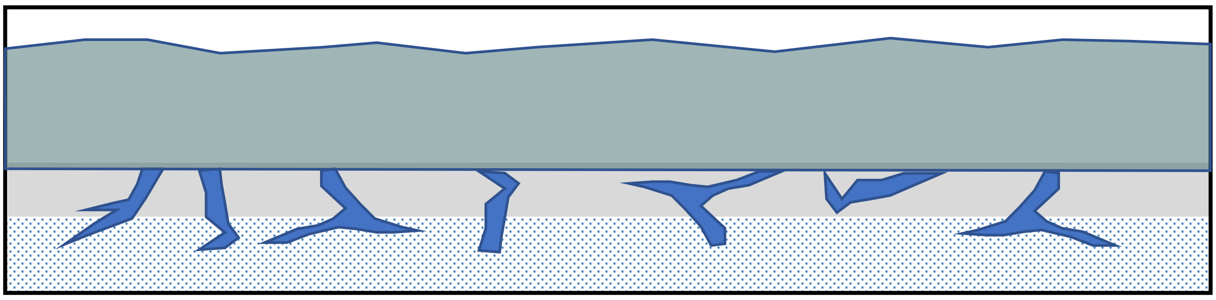
The following diagrams attempt to answer these questions by illustrating the sequence of events that geologists hypothesize to explain these kinds of rocks. It starts with the deposition of sediments that will become chalk. Because the chalk is composed of plankton that lives in the seawater, plankton debris will build up on the sea floor as the animals die. If the rivers that feed into the sea are muddy, then clay will be added to the debris to make sediments that will become marl. If the rivers are not flowing or if they are not muddy, pure chalk can form over time. Chalk can also form from marl when waves or currents stir up the bottom. The wave energy will wash the mud up into the water column and it will be carried off to be deposited in a place where there is no wave or current energy on the sea floor, usually further offshore in deeper water. Changes in climate or sea level can create alternating beds of marl and chalk by changing the input of clay or the water depth.



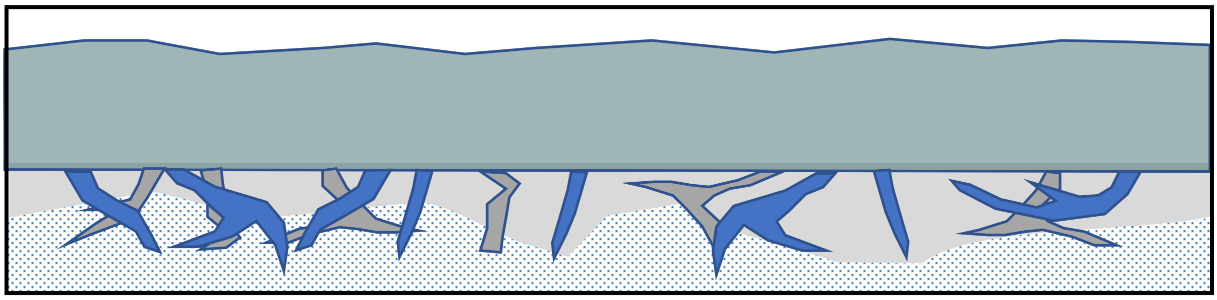
This drawing represents a time when the ocean was calm and there was no clay in the water column so pure chalk sediment forms a layer on the sea floor.



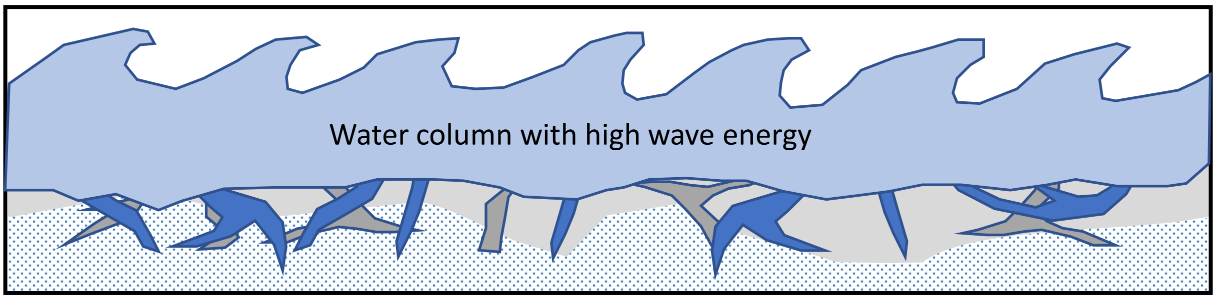
This drawing represents a time when the ocean was calm, and the water column had a lot of clay possibly during a wetter climate when more rain made the rivers muddy. So, a new layer forms on the sea floor that is a mixture of clay and dead plankton.



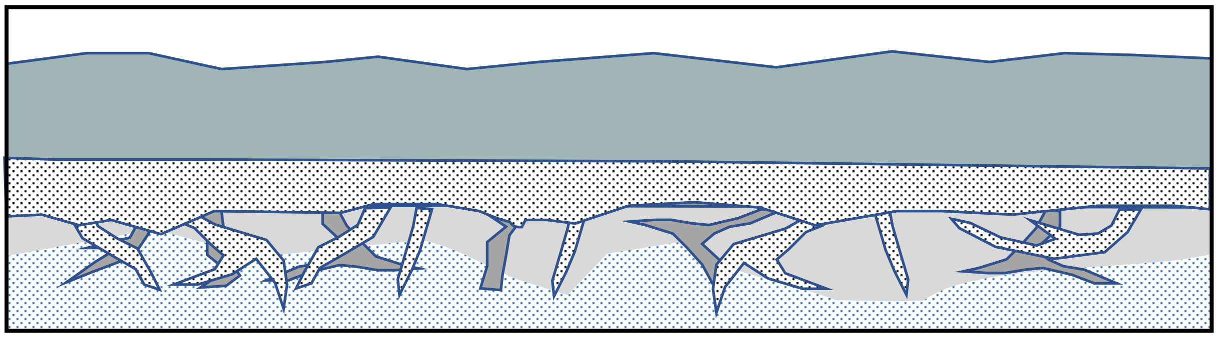
As the ocean remains calm, animals will move into the soft layers of sediment by digging tubes which will be open and water-filled. Once they die the tubes will fill with the mixture of clay and plankton debris.



As animals continue to make new burrows, they disrupt the older, filled burrows and start to mix the two layers together. Where the mixed sediment has more clay, the burrowed and mixed layer will be darker grey. The lighter grey areas are where less clay was mixed in by the burrowers.



Storms create big waves that can erode the sea floor thereby producing an irregular surface that geologist call a "scour". The scour cuts the burrows and the mixed-up layers with variable clay content so the layer below the scour ends up with light and dark grey areas. The material that is removed along the scour gets caught up in the water column by the waves and stays there while the energy remians high.



As the wave energy starts to drop, the plankton debris settles out from the water to form a new layer that will become pure chalk. The last set of open burrows gets filled with this plankton debris also. After all of this is buried, the result is a layer below the scour that has multiple generation of burrows with the last set colored white. The rest of that layer has two shades of grey.

In this view, one can see the irregular surface of the scour and the truncated burrows with the white fill. The overlying layer stands out because it is harder. It has less clay than the layer below. Clay makes a rock softer, so it erodes more easily. On this hike, you can trace more than one scour for tens or hundreds of feet. Features these sizes were probably created by storm waves but some other kind of current might have done the job. What we can conclude for sure is that there was a low-energy time that provided good habitat for the burrowing animals and then there was an episode of erosion caused by a high-energy event on the sea floor.

If you look down on the flat surface you are standing on, you will see things that look like these two photos. The chaotic pattern of light and dark grey shows how the burrowing animals can thoroughly mix layers together that were once separate. The darker grey patches have more clay so, as rock, they are more of a marl. The lighter patches are more of a chalk because they have more plankton debris.