Sedimentary Rock

Sedimentary rock is formed from either cemented preexisting particles or from minerals that precipitate at surface pressure and temperatures.
Sedimentary Rock

Sedimentary rock has many uses...

Sediment > Rock
- Weathering
- Transportation
- Deposition
- Lithification

Lithification
- Cementation
- Compaction
- Crystallization
Types of Sed. Rxs

- Detrital sedimentary rocks
- Chemical sedimentary rocks

Detrital Sed. Rxs.

Detrital sedimentary rocks are based on grain size and not composition. There are conglomerates or breccias, sandstones, silts, and shales or mudstones. Sediments are deposited under the influence of gravity, so they tend to lie in broad horizontal sheets called strata.
“Sand” is a size term - not a mineral term. Sand isn’t always quartz.

“Clay” is used in two ways. The word may represent “clay minerals” or it may represent “clay grain size.”

**Conglomerate**
- Rounded fragments – mixed matrix

**Breccia**
- Angular fragments – mixed matrix

**Sandstone**
- This example is a quartz sandstone.
Sand is found in many environments. For example, sand in these sand dunes might eventually be lithified into a sandstone in the geologic record. Siltstone + Shale/Mudstone
Shale may be black, indicating it is rich in organic compounds. This shale also had plant fossils. Siltstone + Shale/Mudstone
Over 50% of all sedimentary rocks!!! Shale/Mudstone may also be colorful, as are these paleosols (ancient soils).
Distance from Source

In general, the farther you are from the erosional source of sediment, the finer grained the sediment (because of mechanical and chemical weathering). So, very coarse sediments, like conglomerates, are deposited close to sources, while very fine-grained sediments, like clay, are deposited further away.

In the geologic record, then, when you find conglomerates they were probably deposited near an ancient sediment source, but shales or mudstones were deposited at some distance from the source.
Ancient Beach or Dune Deposits

Ancient River Channel Deposits
One channel
West of Taos, NM

Erosional and Deposition Environments

Conglomerates and Muds Alluvial Fan Shale/Mudstone Paleosols
Big Bend NP
Chemical Sedimentary Rocks

Chemical sedimentary rocks are formed at surface temperatures and pressures either through organic or inorganic processes. Salts are inorganic, but many marine organisms precipitate calcite in the form of skeletons or microscopic needles. Coal is a type of chemical sedimentary rock formed of the organic remains of plant material.

Typical Chemical Sedimentary Rocks

- Limestones
- Chert
- Evaporites
- Coal
Limestones

Limestones are the most abundant chemical sedimentary rocks. They are mostly made of calcite. Limestones usually form at sea, but some form in lakes or caves where there is much dissolved calcite. They are either organic or inorganic in origin.

White Cliffs of Dover, England

In central Texas abundant limestones are resistant to weathering and form many cliffs.

These thick limestones in Big Bend National Park represent extensive carbonate shelves, like the Bahamas today!

Fossil reefs are largely made of skeletal remains of organisms.

El Capitan West Texas
Limestone can also form in caves because of active calcite precipitation.

Organic limestones form either from precipitation of calcite by bacteria or by cementation of calcite seashells.

Chert

Chert is a microcrystalline silica, whose common names include flint and agate. Chert can form on the ocean floor, but usually forms in the sediment long after deep sea sediments have been buried.

Chert (and its varieties) has always been important for the production of stone tools.

Flint was also important in early firearms because it easily made sparks to touch off gunpowder.

Agate

Chert colors reflect tiny chemical impurities with the quartz, frequently iron or sulfur.
Evaporites

Evaporites form when large bodies of water evaporate. This has happened in the Mediterranean Sea and in the early Gulf of Mexico. When vast amounts of salty sea water evaporate, various salts are left behind and these can be hundreds to thousands of feet thick. Evaporites include rock salt and gypsum. Since these rocks form by the evaporation of water they are called evaporites.

Modern salt is usually mined, but in many places it is also ‘harvested’ from evaporating seawater.

Permian Basin

The evaporites you saw in the last slide were produced when, about 250 million years ago, the Permian Basin was closed off from the Panthalassic Ocean and it evaporated!
Mediterranean

About 6 million years ago, the entire Mediterranean Sea was closed off at the Straights of Gibraltar and totally evaporated. This resulted in thousands of feet of salt and gypsum being evaporated out on its floor.

In Summary.....

- Chemical and Nonchemical Sed. Rxs.
- Nonchemical sed. rock names based on grain size and then grain shapes.
- Chemical sed. rock names based mainly on chemistry.
- Different sed. rocks are deposited in different environments and always carry clues as to their genesis.