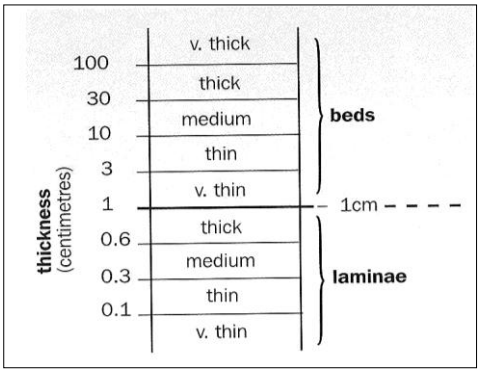
Geology – how to do it..... No.2

How to identify sedimentary rocks

Sedimentary rocks are composed of particles derived from the physical, chemical and biological processes at the surface of the Earth.

How do you recognise a rock as sedimentary?

- They are composed of particles which can be loose (unlithified) or bound together by a cement to form rock (lithified)
- They are laid down in subparallel beds (strata) *see figure below*
- They may contain fossils.
- They may show sedimentary structures (e.g. ripples, mudcracks)



If more than 1 cm thick the layer is a 'bed'
If less than 1 cm thick layers are called laminae.
It is important to record the thickness of sedimentary layers.
This observation can be crucial to interpretation.

There are six main types:

1. **Siliciclastic** (e.g. mudstones, sandstones, conglomerates)
   Detrital grains derived from the weathering and erosion of pre-existing rock.

2. **Carbonate** – limestones. Usually formed in the sea, but can form in lakes in arid environments and in caves (as flowstone, stalagmites and stalagtites).

3. **Chemical - evaporitic** (e.g. halite, gypsum and other salts). Formed from the precipitation of chemicals dissolved in concentrated solutions.

4. **Chemical – iron enriched** are ironstones (Fe > 15%); **pure silica** are cherts or flint.

5. **Organic** – carbon based organic material (e.g. plants on land or plankton in the sea) which has not decomposed in the normal way and has been compacted and heated to various degrees.

6. **Volcaniclastic** (pyroclastics such as ash, tuff or agglomerate)
   Fragments derived directly from fall out of volcanic activity.

Within each of these groups there are further subdivisions based on characteristics such as clast size, chemical composition, textures and sedimentary structures.

Cement – the grains are held together by usually one of three types:
Calcite: will fizz with acid; scratches with coin & steel knife; crystals show cleavage(3)
Quartz: will not fizz with acid; will not scratch even with steel, no cleavage, hard.
Iron oxide: variable hardness; high density; most noticeable by the colour – various shades from reds, browns, yellow-orange, to black (where reduced can be green or blue-green).

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How do we identify rocks? For the UK climate and Buckinghamshire geological history we can pretty much discount evaporates, and organic and volcaniclastic are so minor as to be almost negligible. Ironstones are very minor also, so pretty much all the rocks you will come across will be siliciclastic (the mudstones and sandstones) or they will be limestones. However, all types are described below for completeness.

Rock	Identifying features
Siliclastic	Particles made predominantly from silica (quartz) or a mud/clay* with rock fragments, other minerals and minor organic component. Naming depends on grain size finest are mudstones, then siltstone, sandstone and conglomerates or breccias. Conglomerates have rounded pebbles, but breccias have angular pebbles.
Limestone	The particles are predominantly carbonate (calcite) and hence the rock will fizz with acid. Further identification is by particle type e.g. shelly limestone, oolithic limestone, chalk, etc.
Evaporite	Dissolves in water. Soft – will often scratch with a finger nail. A variety of salts including halite (table salt), gypsum, etc.
Chemical	A mineral precipitate such as iron oxide (ironstones, notable for high density and red-brown colours) or silica (such as chert or flint – hard and will not scratch with steel knife).
Organic	Composed of biological material (e.g coal) but often present as an organic film or coating to surfaces or fossils. Often dark in colour and soft – can be scratched or removed by fingers.
Volcaniclastic	Produced by volcanoes, but deposited in a sedimentary way, such as ash settling out in layers for instance. Coarse deposits such as pyroclastics can be identified as volcanic fragments, but ash will resemble a pale clay and only chemical testing will be able to identify it as volcanic ash.

* strictly clays, making claystone, are not siliclastic, but alluminosilicates with a complex interpretation.

Sandstone (Lower Greensand) in St Mary's Church, Great Brickhill.
One block has small pebbles scattered in it. The dark colour is an iron oxide cement.

Limestone (Blisworth Limestone) in Thornborough Bridge near Buckingham. The inclined lines are called cross-strata

For information on sedimentary structures such as cross-strata see 'How to....' Guide No.3.