# Primary sedimentary structures

# Types of primary sedimentary structures

- Inorganic sedimentary structures
- Organic sedimentary  structures

# Inorganic sedimentary structures

A. Internal sedimentary structures
B. Bed forms and surface markings
C. Sole marks

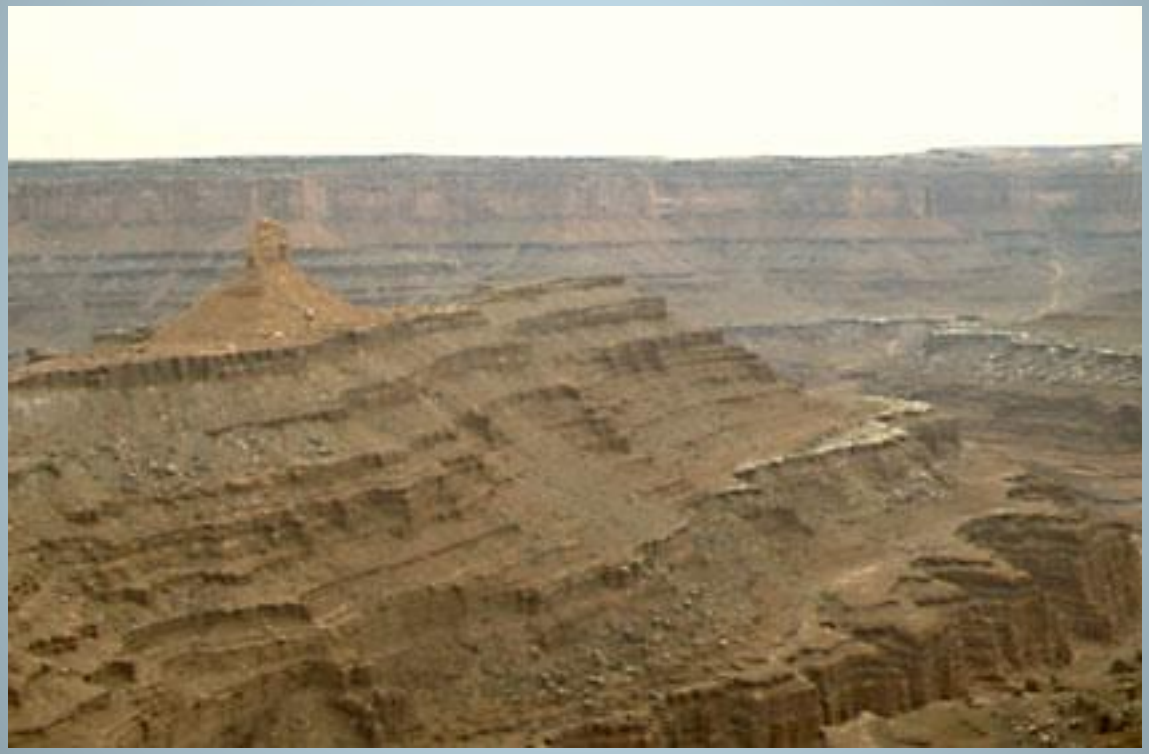
# Internal sedimentary structures

- **STRATIFICATION**

***Stratification is by far the most important sedimentary structure.. And stratification is certainly the single most useful aspect of sedimentary rocks in terms of interpretating depositional conditions.***

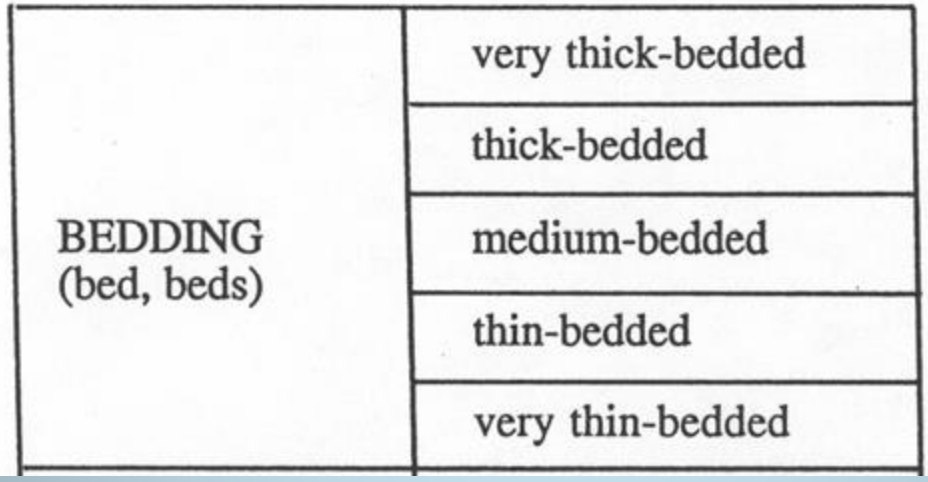
***Stratification can be defined simply as layering brought about by deposition***

**In looking for the stratification, always think in terms of *changes in composition, texture, and/or structure from bed to bed.***



**Here's a list of things that tend to make stratification apparent to the eye:**

- obvious differences in *grain size*
- obvious differences in *composition*
- *color/shade differences caused by slight differences in composition.*



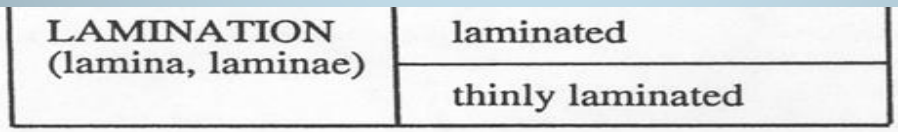




**Figure 3-3** Terminology for thickness of strata


FossilEAustralia.com 2014

FRACKING SHALE? - MILLIMETRE-SCALE LAMINATION IN THE SOURCE ROCK, BITUMINOUS SHALES OF THE LOWER LIAS, SHALES-WITH-BEEF, LYME REGIS.
Lamination on this scale is not easily seen in the muddy cliffs. This is a clean, sea-washed, fallen block, but the way-up is not known. The lamination contrast has been enhanced in the image. The scale rule shows millimetres and centimetres. Small, light-coloured seams of beef (diagenetic fibrous calcite) can be seen. These are, according to one theory, the consequence of crystal growth during hydrostatic overpressure. This shale is not thermally mature here at Lyme Regis, but is mature further east offshore between Swanage and the Isle of Wight. It has yielded huge quantities of oil to the Wytch Farm oil field. Will it yield gas by offshore hydraulic fracture or fracking? Ian West © 2013.

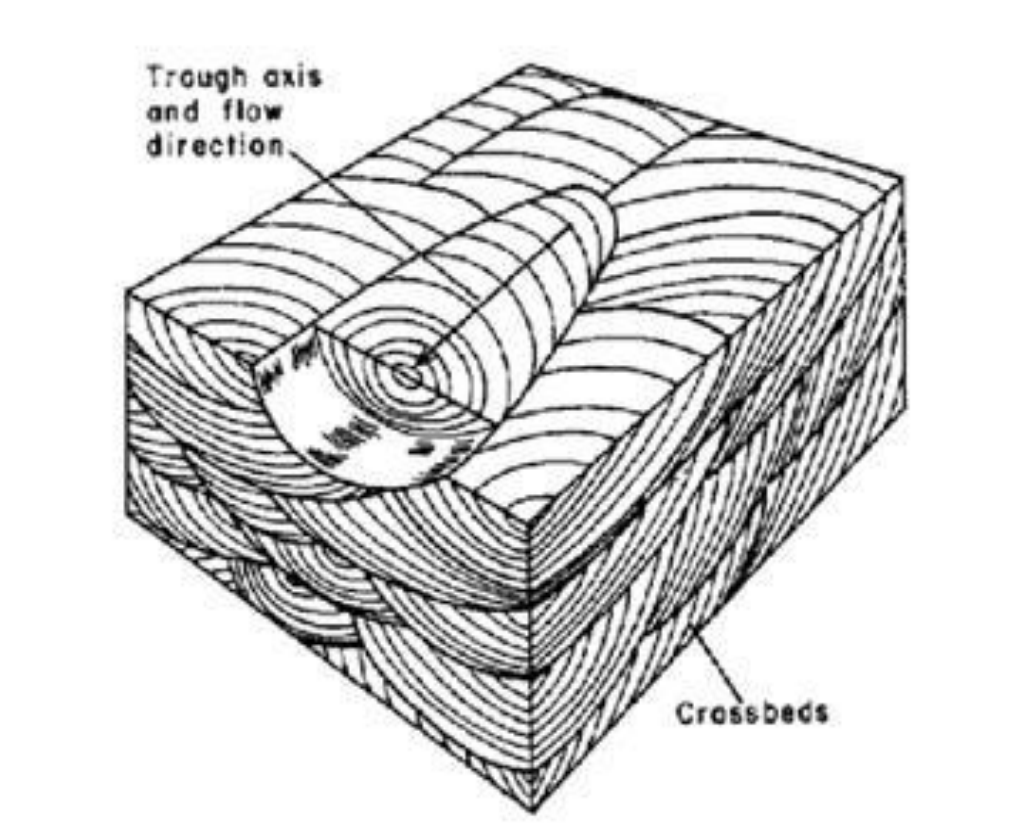
- **Keep clearly in mind the distinction between *stratification and parting. Parting is the tendency for stratified rocks to split evenly along certain stratifi-cation planes.***
- ***Varves :- verves are special type of lamination which forms in glacial lakes.***

❑Cross stratification

***Cross stratification is stratification that is locally at some angle to the overall stratification as a consequence of changes in the geometry of the depositional surface during deposition.***

- ***Cross bedding***
- ***Cross lamination***

- If the individual inclines layers are thicker than 1 cm, the cross stratification may be referred to as cross bedding.
- Thinner inclined layering is called as cross lamination.




**The crossbeds form a definite pattern that is repeated many times.**

# Graded bedding

- In geology, a **graded bed** is one characterized by a systematic change in grain or clast size from the base of the bed to the top. Most commonly this takes the form of *normal grading*, with coarser sediments at the base, which grade upward into progressively finer ones

# B Bed forms and surface markings.

- Ripples
- Mud cracks
- Raindrop prints

# Ripple marks

- Ripple marks usually form in conditions with flowing water. There are two types of ripple marks.
- Symmetrical
- asymmetrical

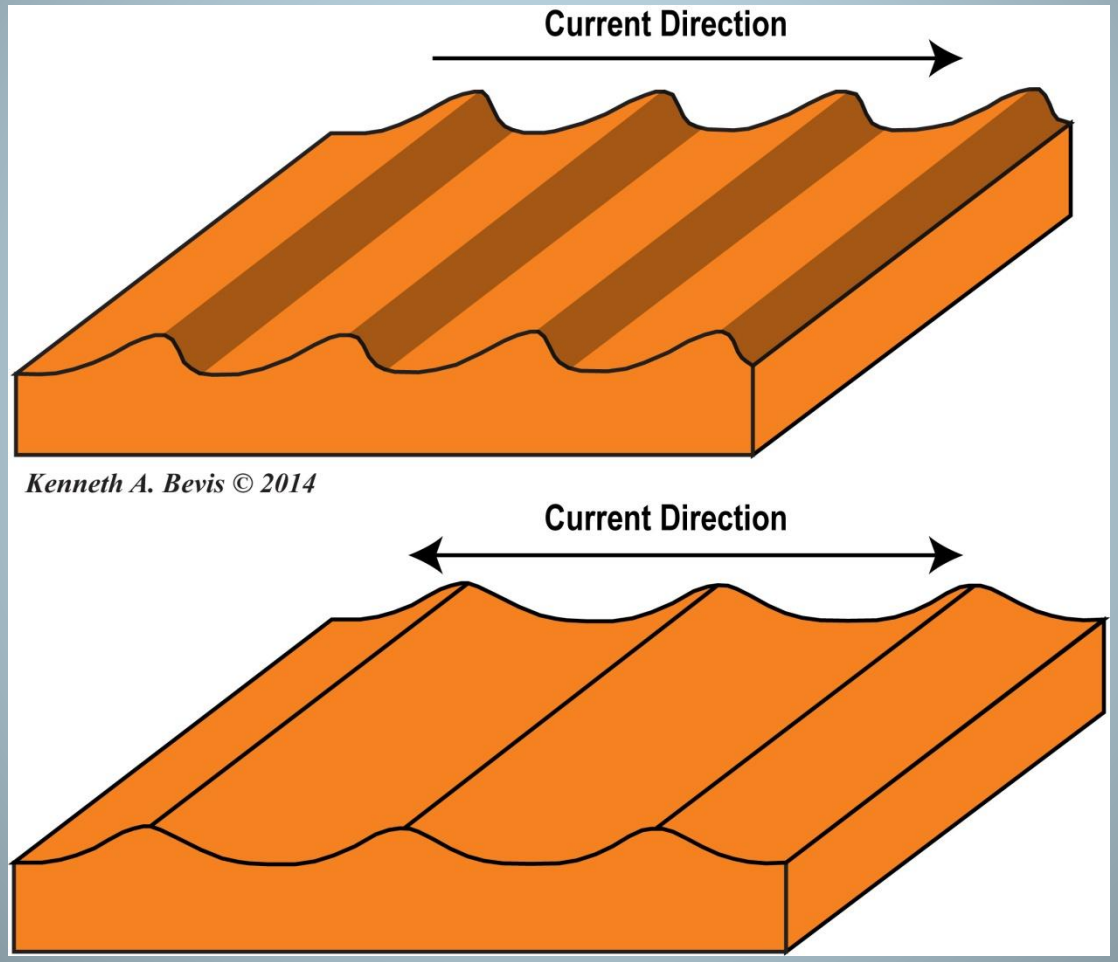
**Ripple marks in red sandstone**

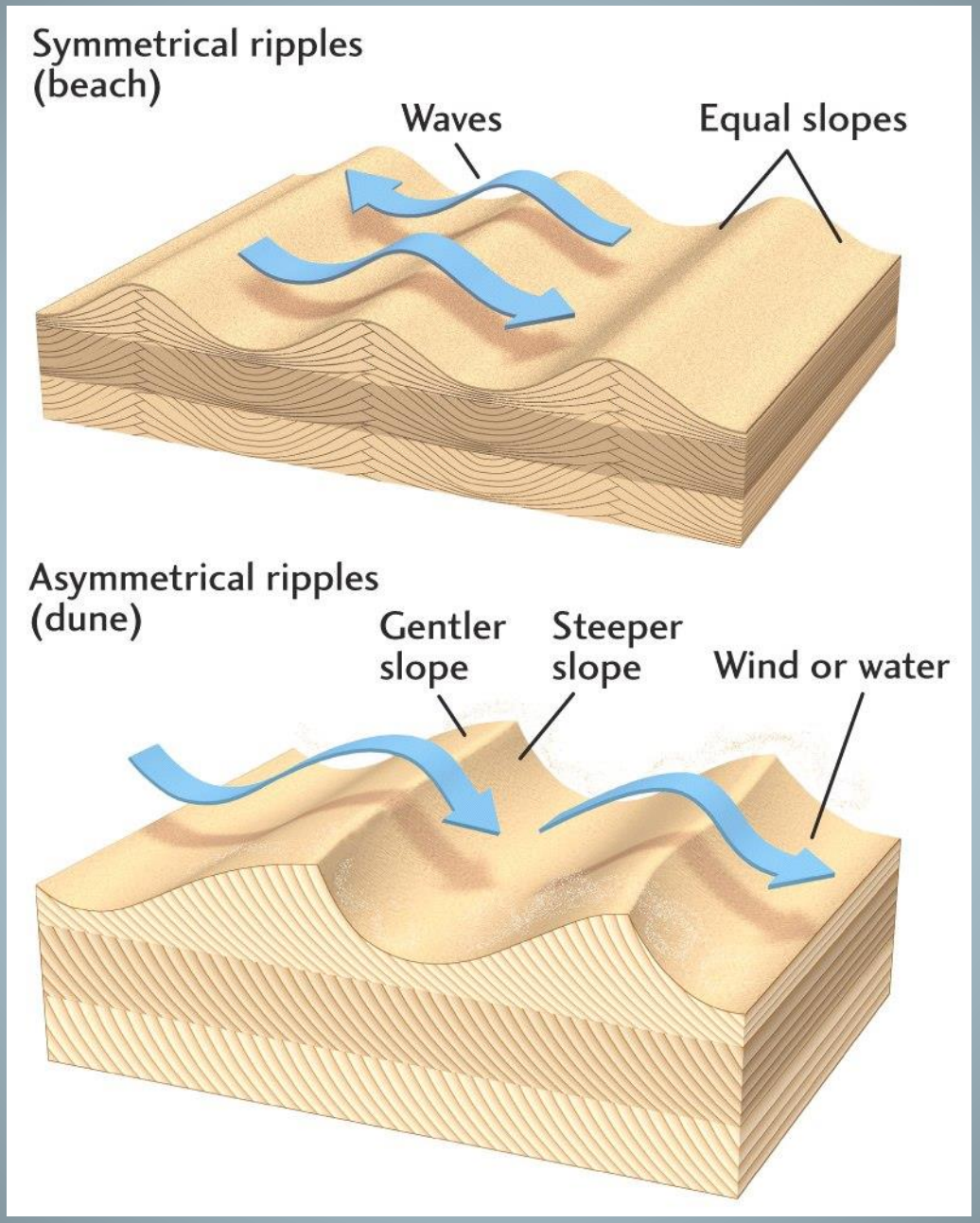
**Current ripples in sedimentary rocks**

- **Symmetrical ripple marks** - Often found on beaches, they are created by a two way current, for example the waves on a beach (swash and backwash). This creates ripple marks with pointed crests and rounded troughs, which aren't inclined more to a certain direction.

- **Asymmetrical ripple marks** - These are created by a one way current, for example in a river, or the wind in a desert. This creates ripple marks with still pointed crests and rounded troughs, but which are inclined more strongly in the direction of the current.

# Comparison




Symmetrical ripples
(beach)
Waves
Equal slopes
Asymmetrical ripples
(dune)
Gentler
slope
Steeper
slope
Wind or water

# Mud cracks

- Mud cracks are polygonal pattern of cracks produced on surface of mud as it dries.


© QT Luong / terragalleria.com

**Kiabab limestone mudcracks.**

# Raindrop prints

- Raindrop prints are circular pits on sediment surface produced by the impact of rain drop produced on soft mud.


© John Mazor 2007


3 cm

**Mud cracks along with rain drops**

# C Sole marks

Sole marks are bedding plane structures preserved on the bottom surfaces of bed.

- Tool marks
- Flute marks

# Tool marks

- Tool marks are produced as tools (such as sticks, shells, bones)carried by a current bounce, skip, roll, drag along the sediment surface.

**Tool mark: Indention of the cohesive mud bottom by a "tool," and object dragged across sediment by current**

# Flute marks

- They are produced by erosion or scouring of muddy sediment, forming scoop-shaped depressions.

# Organic or biogenic sedimentary structures

- Trace fossils

1. Tracks
2. Trails
3. Borrows
4. Borings
5. Rootmarks

**Trace fossils in one layer**

1 Tracks

tracks or footprints are impressions on the surface of bed of sediment produced by the feet of animal.


**dinosaur footprint in the Lower Jurassic Moenave Formation.**

2 Trails

trails are groove-like impressions on the surface of bed of sediment produced by an organism which crawls or drag part of its body.

3 Burrows

burrows are excavations made by animal into soft sediment,

**burrows produced by crustaceans, from the Middle Jurassic, Makhtesh Qatan, southern Israel**

4 Borings

they are holes made by animals into hard material such as wood shells etc.


**Numerous borings in a Cretaceous cobble,**

**Sponge borings**

5 Root marks

root marks are the traces left by the roots of plants in ancient soil zones.