Sedimentary Structures:

• Features in sedimentary rocks that reflect depositional or diagenetic processes.

– Diagenesis:

• physical and/or chemical changes to sediments following deposition and up to metamorphism.
Sedimentary Structures:

- Sedimentary structures can sometimes yield information on:
  - paleocurrent direction, and
  - stratigraphic “up” direction
- Latter is useful if working in folded and potentially overturned rocks.
Sedimentary Structures:

• 1) bedding:
  - sediments deposited in layers (most commonly parallel to Earth’s surface)

If layers are thinner than 1 cm, typically termed “laminations”
Sedimentary Structures:

2) graded bedding:
   - coarser sediments on bottom

Deposition from a *waning* current
Sedimentary Structures:

• 2) graded bedding:
Sedimentary Structures:

• 2) graded bedding:
Sedimentary Structures:

- 2) graded bedding:
Sedimentary Structures:

- 3) imbricated clasts:
  - flattened clasts imbricated in stream bottom:

Current direction

Can’t be used for stratigraphic “up”
Sedimentary Structures:

• 3) imbricated clasts:
Sedimentary Structures:

• 3) imbricated clasts:
Sedimentary Structures:

4) Sole Marks & Casts:

- Sedimentary structures preserved on the underside of a bed
- Typically an infilling (cast) of a depression in the underlying bed

![Diagram showing original structure and cast]

Original structure (e.g., groove)

Cast of original structure (e.g., groove cast)
Sedimentary Structures:

• 4) Sole Marks I; flute casts
  – Scoured out depressions in mud (usually associated with turbidity currents).

Steep side faces current!
Sedimentary Structures:

4) flute casts:
Sedimentary Structures:

- 4) flute casts:
Sedimentary Structures:

- 4) flute casts:
Sedimentary Structures:

4) Sole Marks II: groove casts
Sedimentary Structures:

- 5) current ripple marks:

Current ripples are asymmetric…

- not equal

erosion

deposition

current
Sedimentary Structures:

- 5) current ripple marks:
Sedimentary Structures:

- 5) current ripple marks:

- trough cross-bedding

- Three-dimensional ripples
Sedimentary Structures:

• 6) oscillation ripple marks:

oscillation ripples are symmetric…
Sedimentary Structures:

• 6) oscillation ripple marks:
Sedimentary Structures:

• 7) cross beds:
  
  – Internal structure of ripples or dunes

Note: beds are truncated on their tops
Sedimentary Structures:

- 7) cross beds:
Sedimentary Structures:

- 7) cross beds:
Sedimentary Structures:

7) cross beds:
Sedimentary Structures:

- 8) herringbone cross beds:

  Common in areas with tidal influence...
Sedimentary Structures:

- 8) herringbone cross beds:
Sedimentary Structures:

• 9) **mudcracks**:
  
  – Formed in drying mud.

 contracts on top first

mud

up
Sedimentary Structures:

- 9) mudcracks:
Sedimentary Structures:

- 9) mudcracks in rocks: