

## GEO 324 -- Stratigraphy and Sedimentology Sedimentary Structures

Sedimentary structures comprise one of the most valuable sources of information concerning the source and depositional environment of sediments and rocks. Moreover, some are used to determine stratigraphic up in regions of deformed strata (see attached sheet). Obviously, these structures are best appreciated if they are observed in the field: both in the modern environments that produce them and their ancient counterparts. As you participate on field trips and field courses during your tenure as a geology major, you doubtless see many sedimentary structures.

The purpose of this lab is to identify the selected sedimentary structures and to answer the following questions:

- Appearance
- Relationship to bedding (top, bottom, inside)
- Time of formation (contemporaneous, penecontemporaneous, secondary)
- Conditions of formation
- Environmental setting(s) of occurrence

Obviously, not all of these questions can be answered by simply examining some specimens. Part of the answers are provided in this exercise, part during lab discussion, part in lecture and other parts from readings and field experience. This exercise is open-ended in that additional information will be provided during our discussion of depositional environments. Your answers can then be supplemented and modified accordingly.

### Classification Problems

Although things are improving, sedimentary structures have been dealt with in a rather haphazard fashion. As a result, the same structure has been given different names in different parts of the world, even in different parts of the same country! No logical system prevails in the nomenclature as is customary in many other scientific classifications. Some are named according to their position relative to the strata (e.g. sole marks), others by appearance (e.g. pillow structure), and still others by the mechanism of their formation (e.g. brush mark). The names chosen here were based on their widespread use. Consult the Atlas and Glossary of Primary Sedimentary Structures available in the lab.

### Procedure

Numerous specimens representing the more common structures have been laid out for your examination. For some there will be more than one example. Learn to identify these structures. Use the table included with the handout to summarize the origin and environment(s) in which the structures are found. The structures are arranged according to where they are found relative to rock strata (top, bottom, interior). Additional pages are provided for notes and sketches. In the tables, record the reference number of the specimen, summarize the origin in a few of your own words and identify the environments in which the structure is found. The table is designed to provide a rapid review of the subject, while your notes and sketches will provide details, if needed.

Structure	Description	Graphic
External Stratigraphic top		
Ripple marks	Sharp crests indicating top of bed	
Desiccation cracks	Developed on cohesive surface; area between cracks commonly concave upward	
Vertical animal burrows	Burrow truncated at top of bed	
Sole (bottom) structures		
Flute casts	Positive relief on bottom surface of bed	
Groove casts		
Load casts		
Ripple mark casts	Sharp crests developed as negative impression on bottom of bed	
Trace fossils	Casts of grazing trails preserved on bottom of bed	
Internal		
Cross-stratification	Cross-stratification sets generally sharply truncated toward top of bed	
Normal graded bedding	Coarser at bottom, finer at top; gradational change	
	Flames of mud projecting toward top of bed	

Figure 5-5  
Primary sedimentary structures useful for determination of stratigraphic bottom versus top.

To supplement your table, the time of formation of the structure is identified where:

P = Primary - formed at the same time the sediment is deposited.

PC = penecontemporaneous - formed almost at the same time the sediment is deposited.

S = secondary - formed after the sediment is deposited. This has no time limit other than its recognition as a sediment or sedimentary rock. Thus, structures formed in association with metamorphism are not sedimentary structures.

Ref. #	Structure	Time	Origin Summarized	Environment
	<b><u>Interior</u></b> Cone-in-Cone	PC		
	Concretions	S		
	Convolute Bedding	PC		
	Planar cross-bedding	P		
	Graded Bedding	P		
	Salt Casts	PC		
	Septarian	S		
	Stylolites	S		
	Banded Iron	P		
	Lamination	P		
	Burrow Casts	PC		
	Pisolites	PC		
	<b><u>Top</u></b> Armored Mud Balls	PC		
	Dendrites	S		

	Mud Cracks	PC		
	Rain Prints	PC		
	Asymmetrical Ripples	P		
	Crawling Tracks	PC		
	Symmetrical Ripples	P		
	<b><u>Bottom</u></b> Bounce Marks	P		
	Brush Marks	P		
	Flute Casts	P		
	Load Casts	PC		
	Trail/Resting Casts	PC		

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