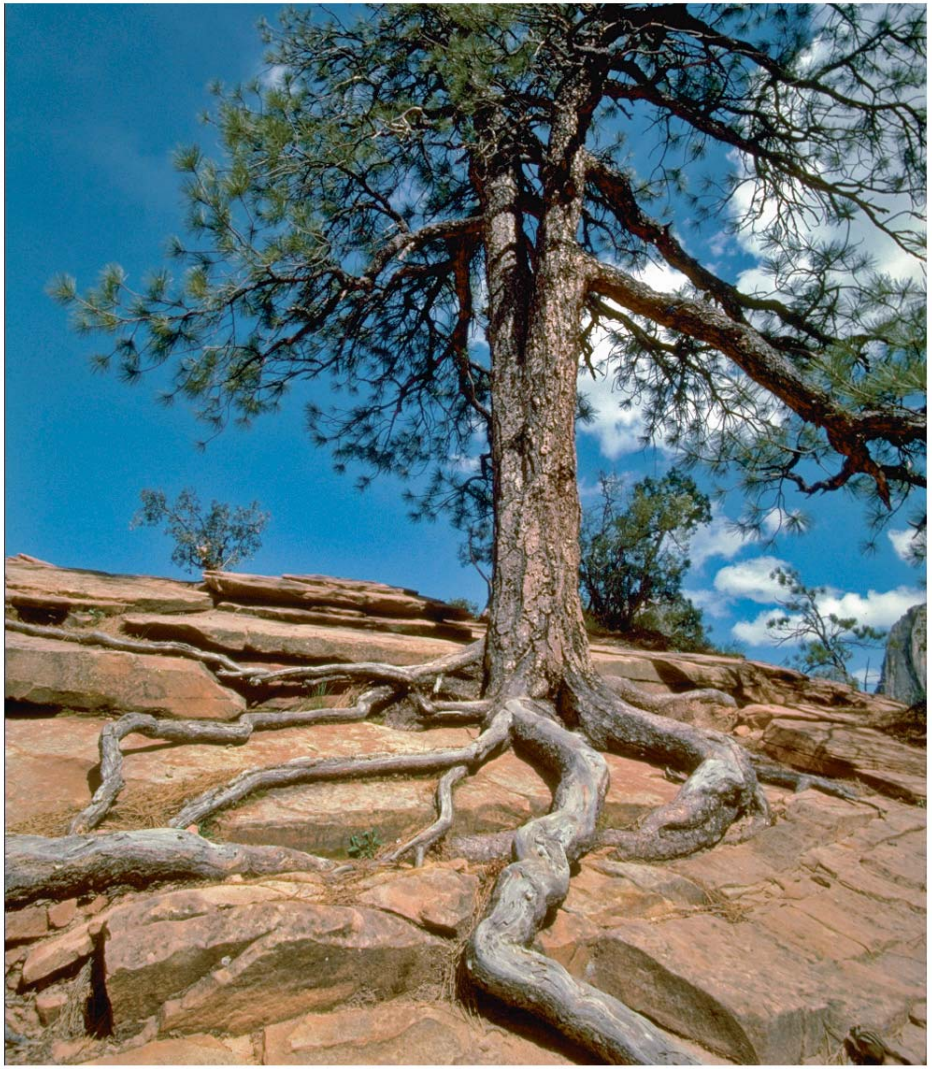
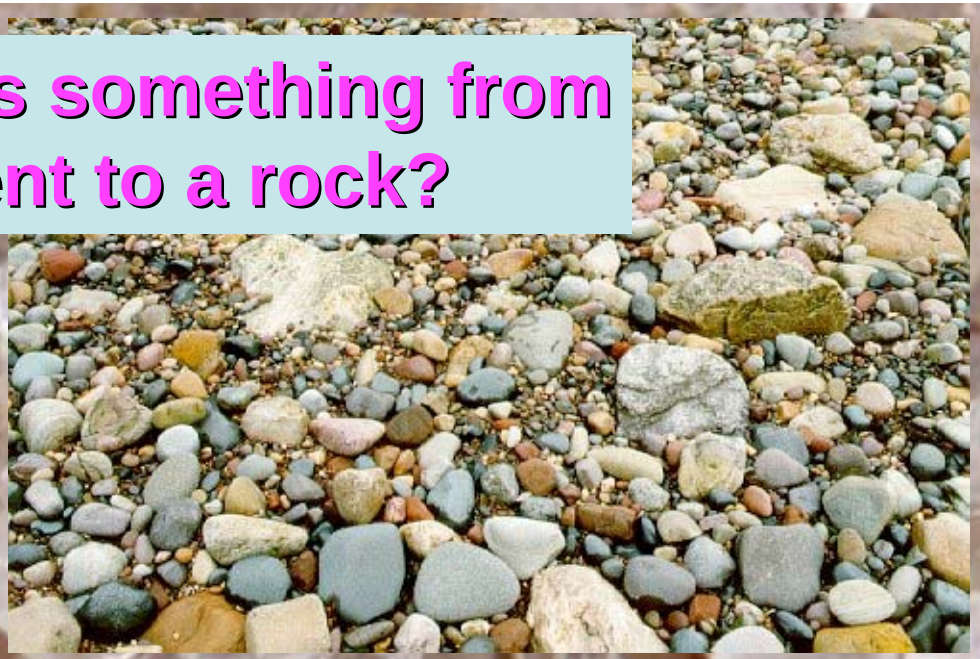


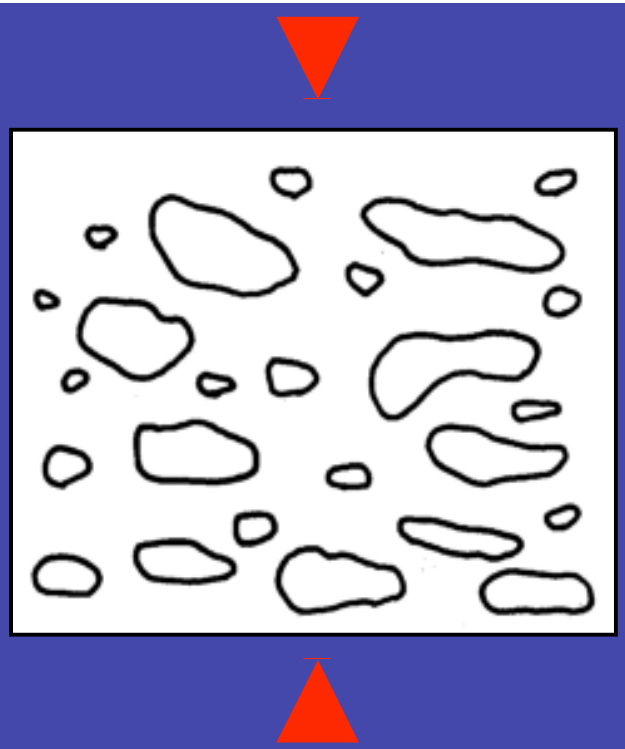


What changes something from a sediment to a rock?





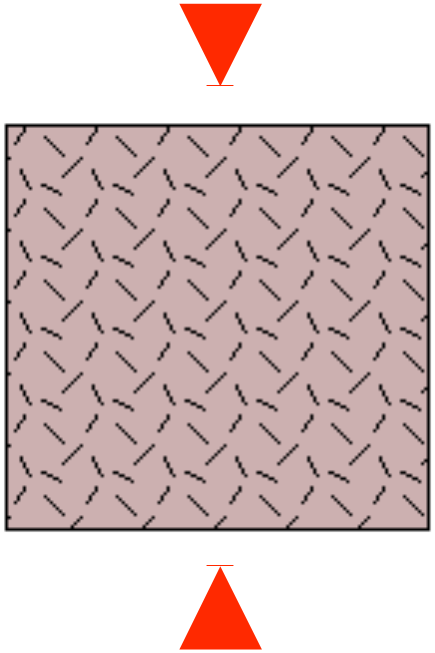


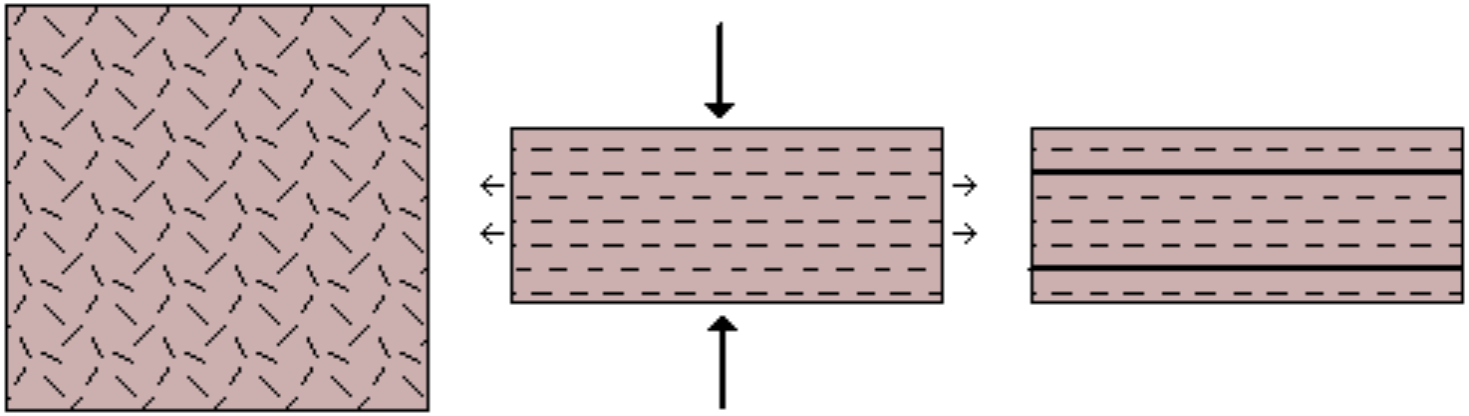


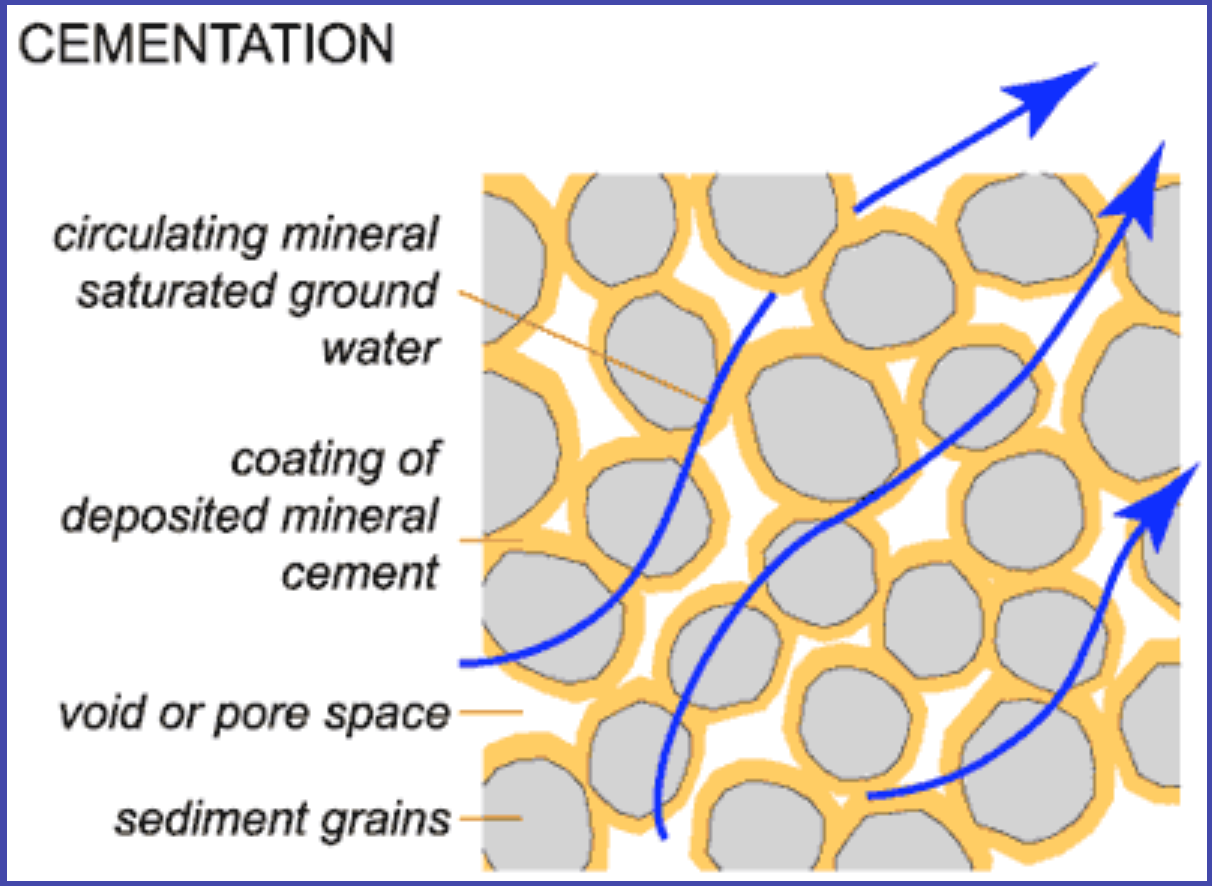


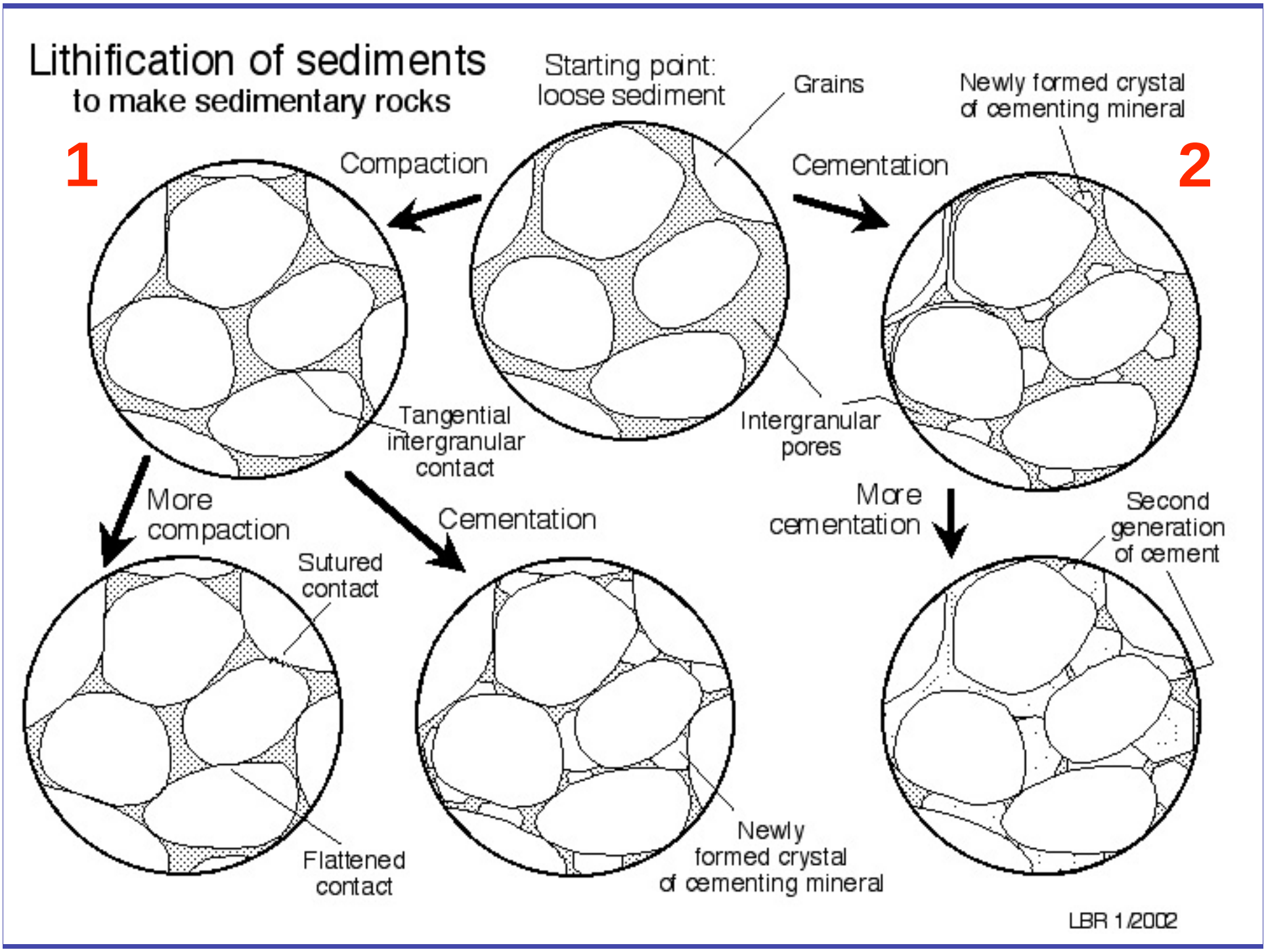


How is porosity changing?




Wet Mud
Compacted Sediment
(water expelled)
Cemented Shale
(splitting surfaces)


CEMENTATION
circulating mineral saturated ground water
coating of deposited mineral cement
void or pore space
sediment grains

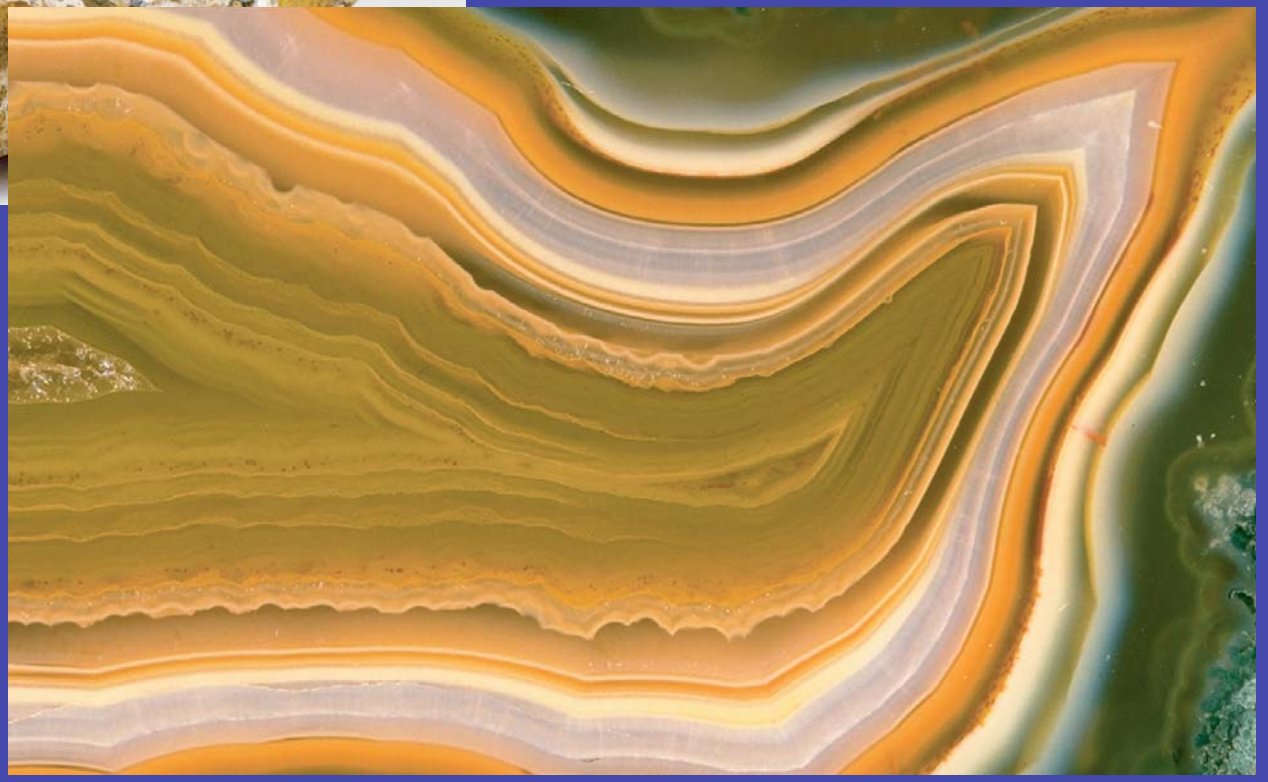

Lithification of sediments
to make sedimentary rocks
Starting point:
loose sediment
Grains
Newly formed crystal
of cementing mineral
1
2
Compaction
Cementation
Tangential
intergranular
contact
Intergranular
pores
More
compaction
Cementation
More
cementation
Second
generation
of cement
Sutured
contact
Flattened
contact
Newly
formed crystal
of cementing mineral
LBR 1/2002

Sedimentary rock formation

1) **Compaction**

2) **Cementation**



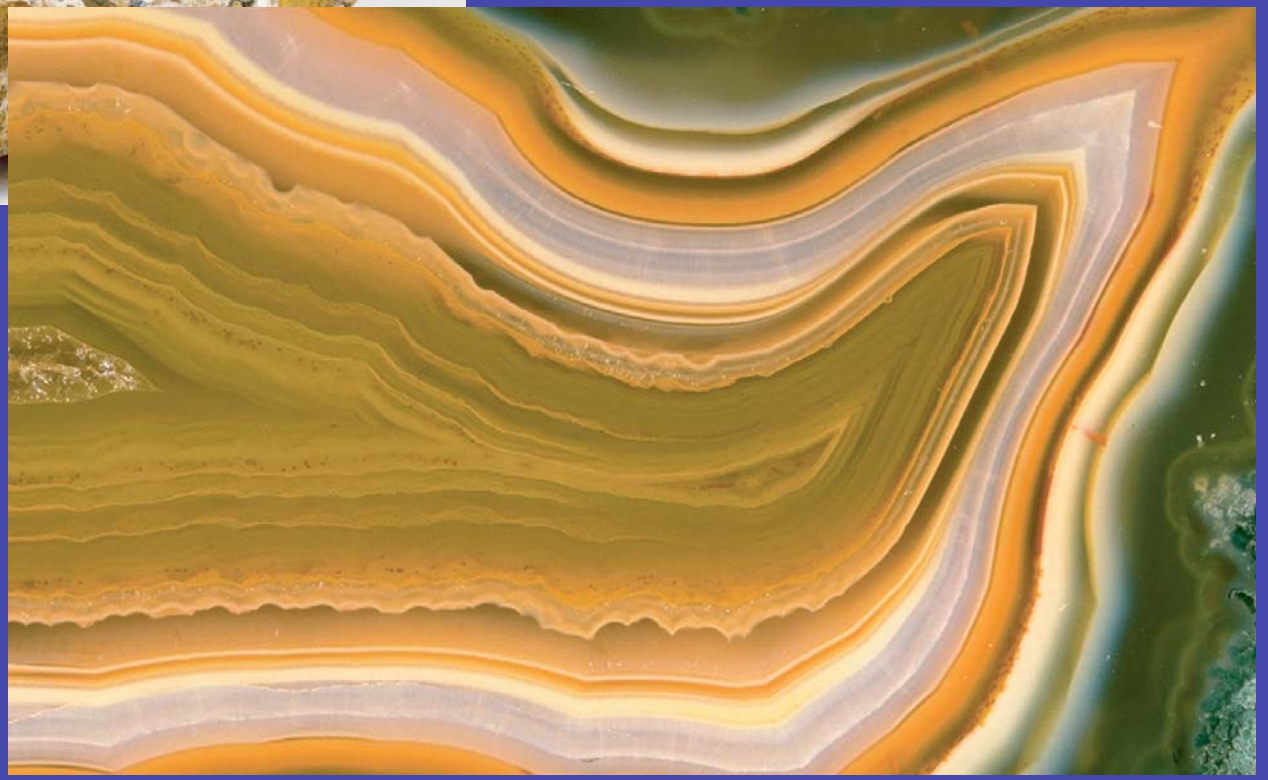




Detrital

(Latin *detritus* “to wear away”)

Chemical




Sandstone


Conglomerate


Shale













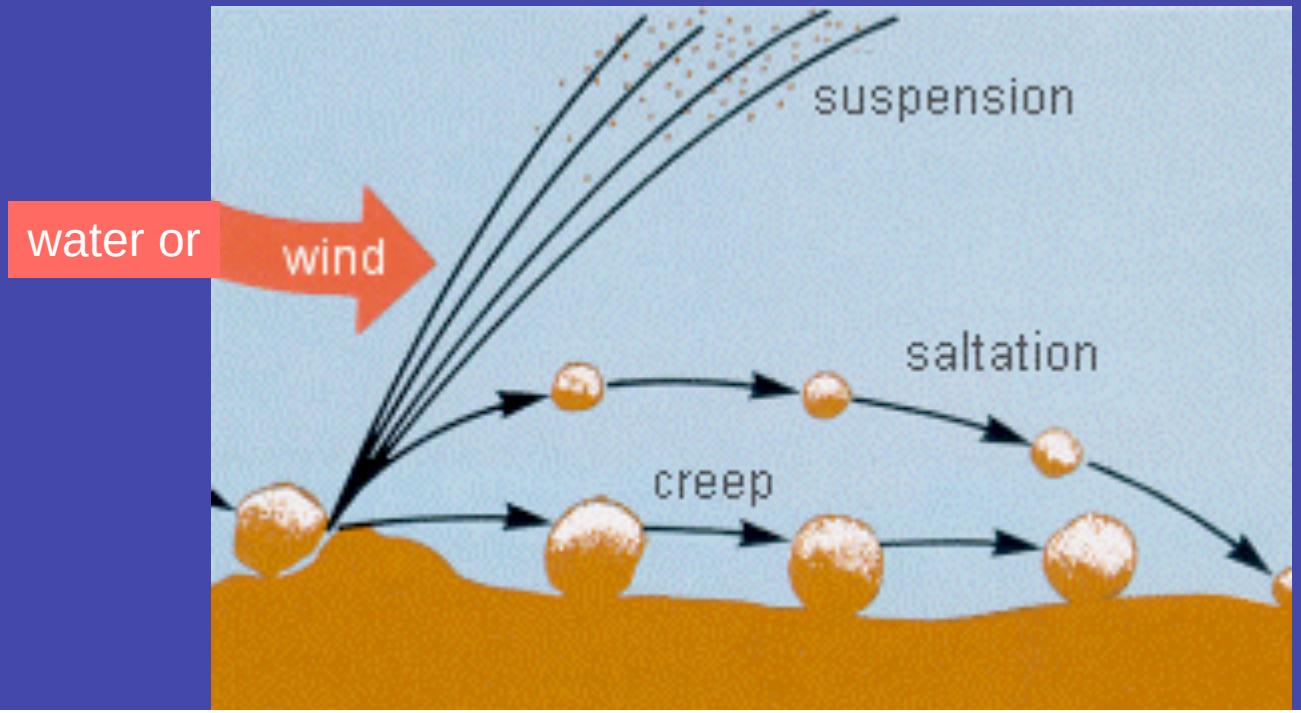
Low Energy **Medium Energy** **High Energy**







Low Energy **Medium Energy** **High Energy**









Low Energy
Small particles

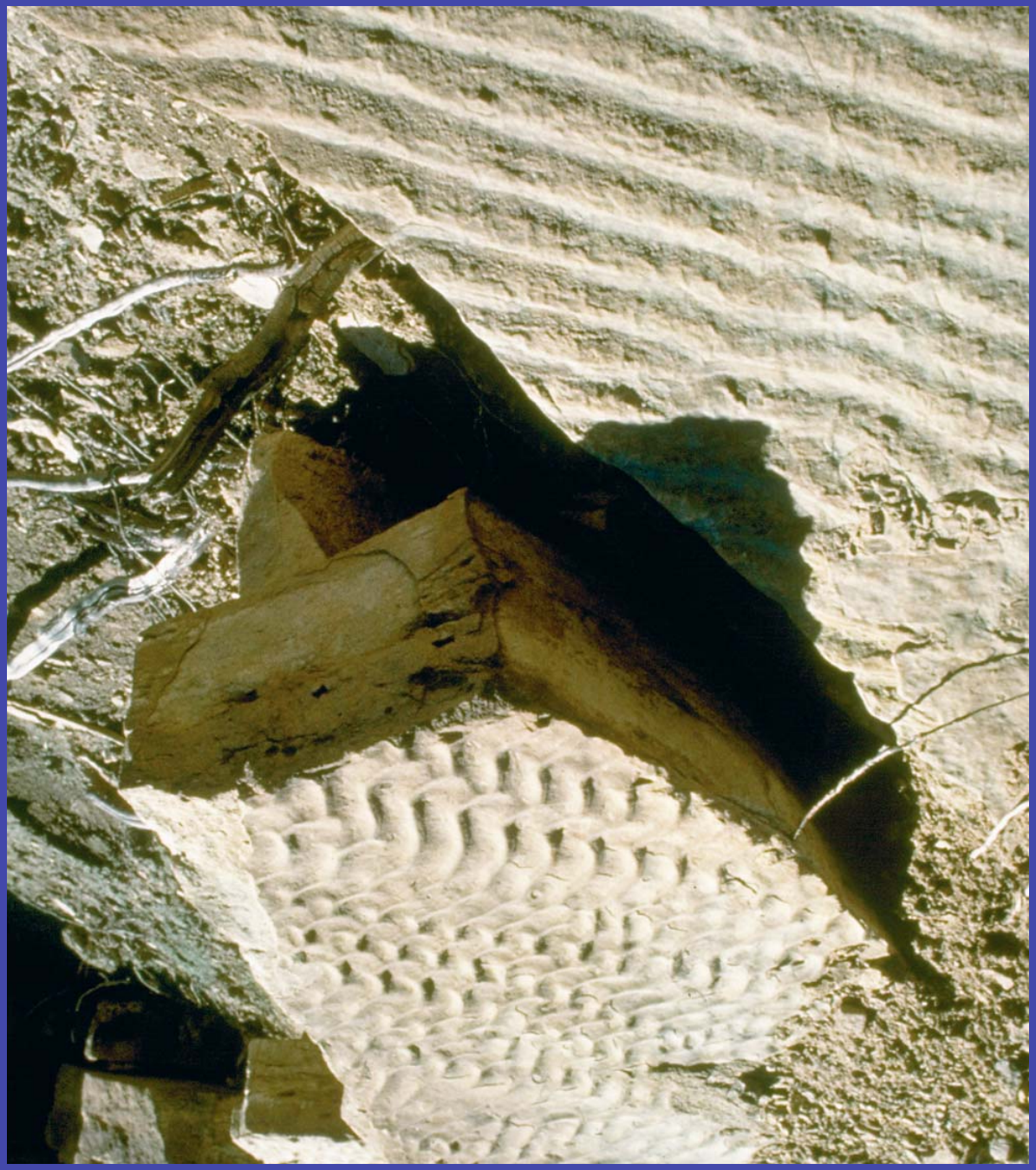
Medium Energy
Medium particles

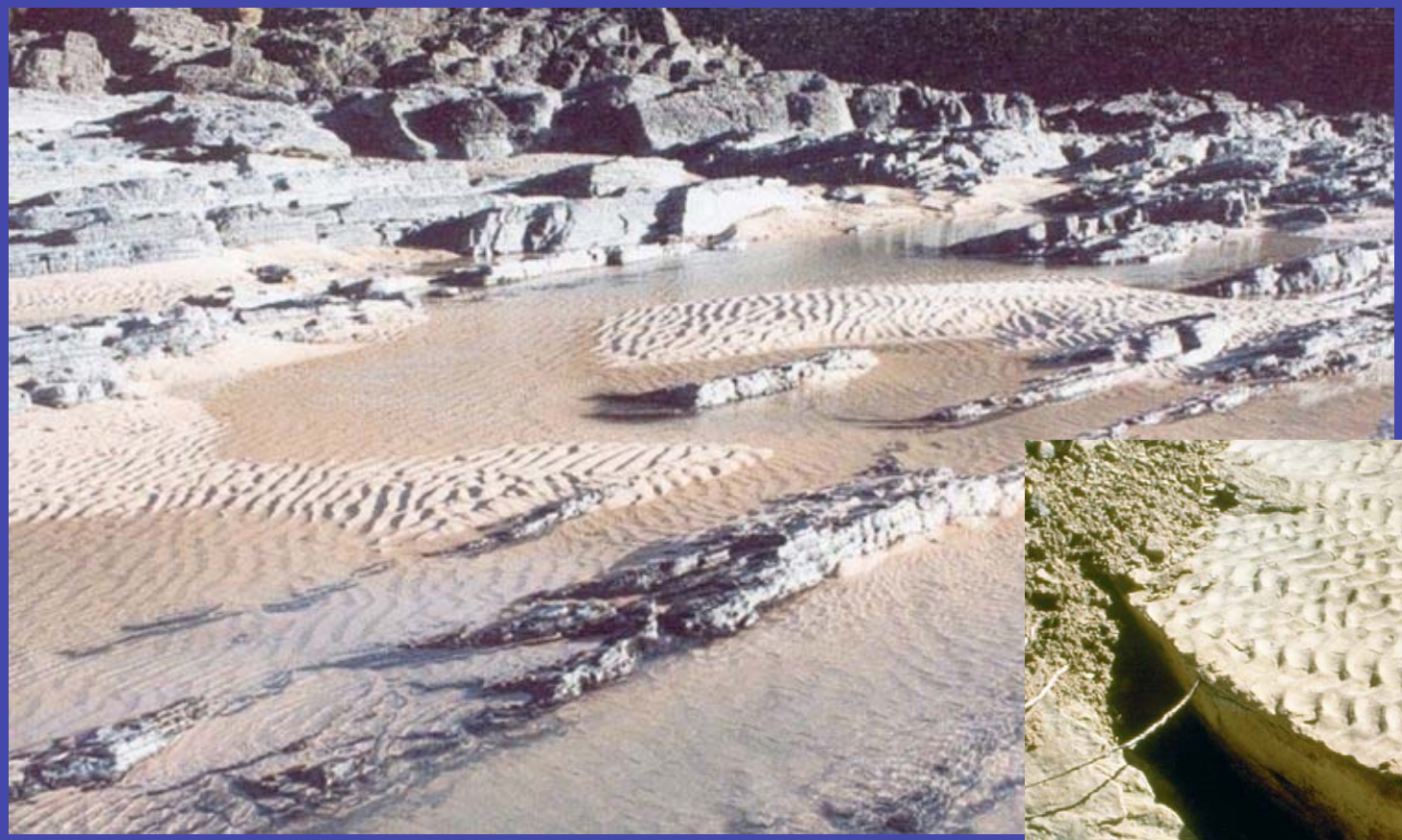
High Energy
Large particles





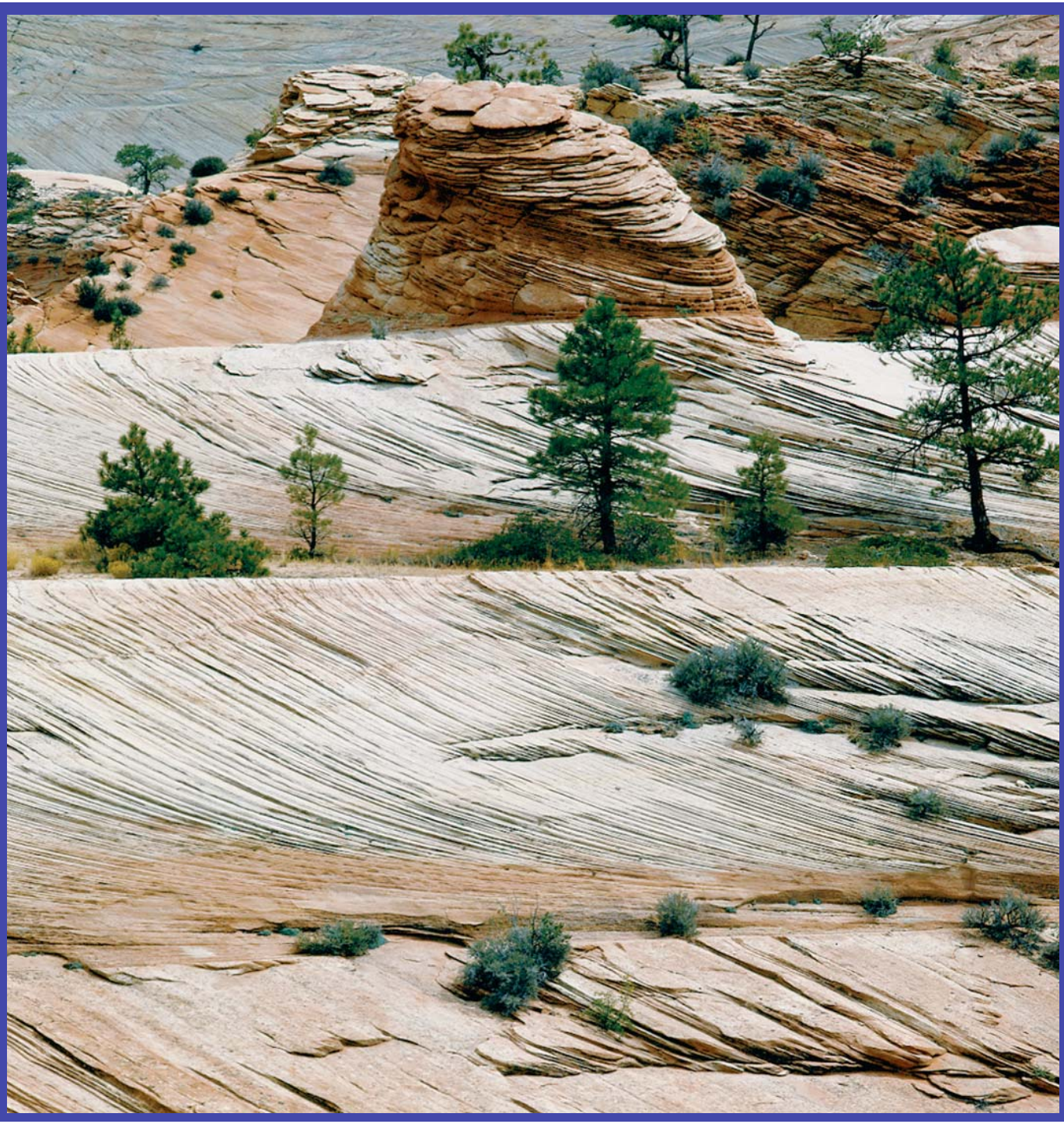








Ripple marks





Sand dunes



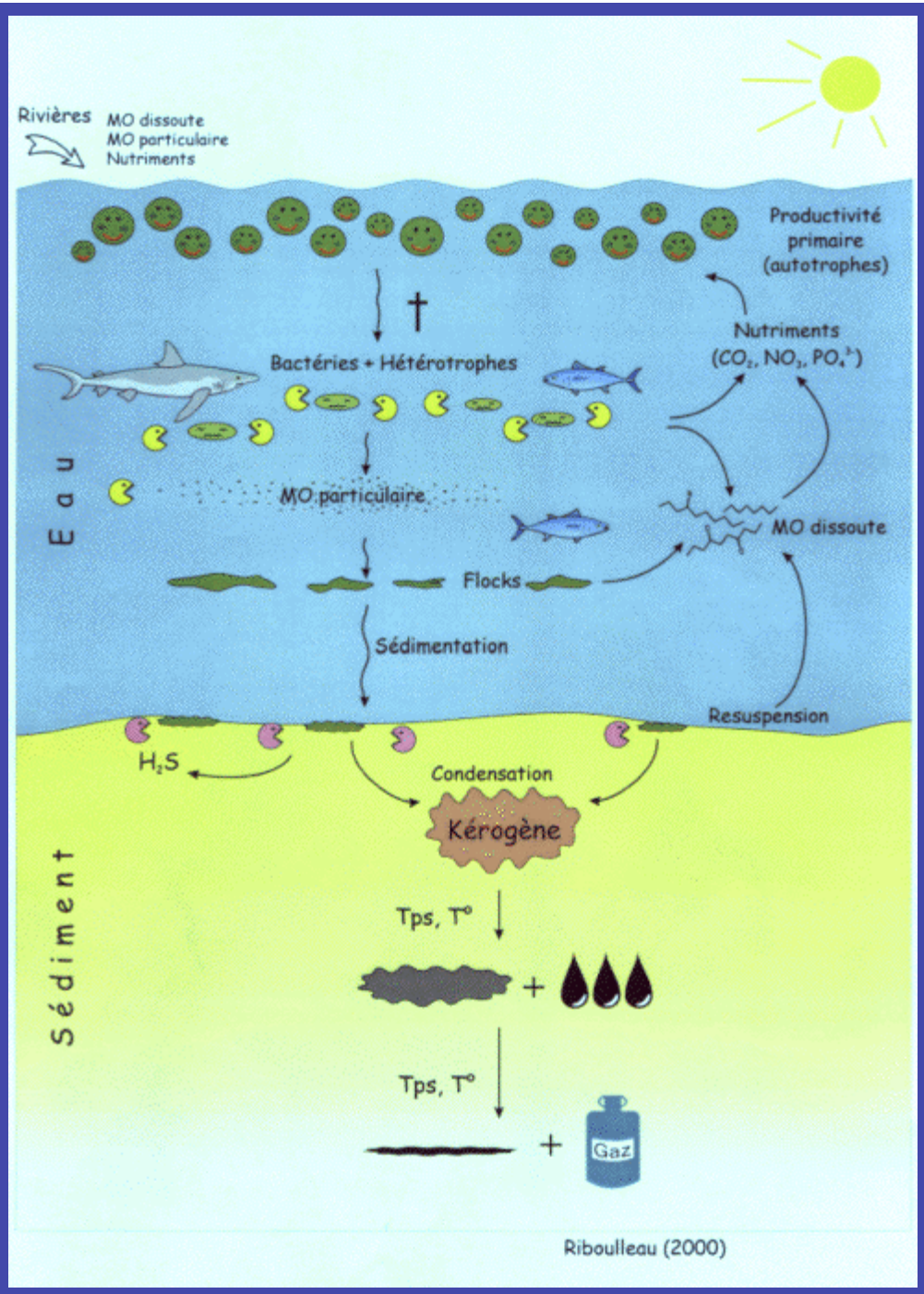
Fossils



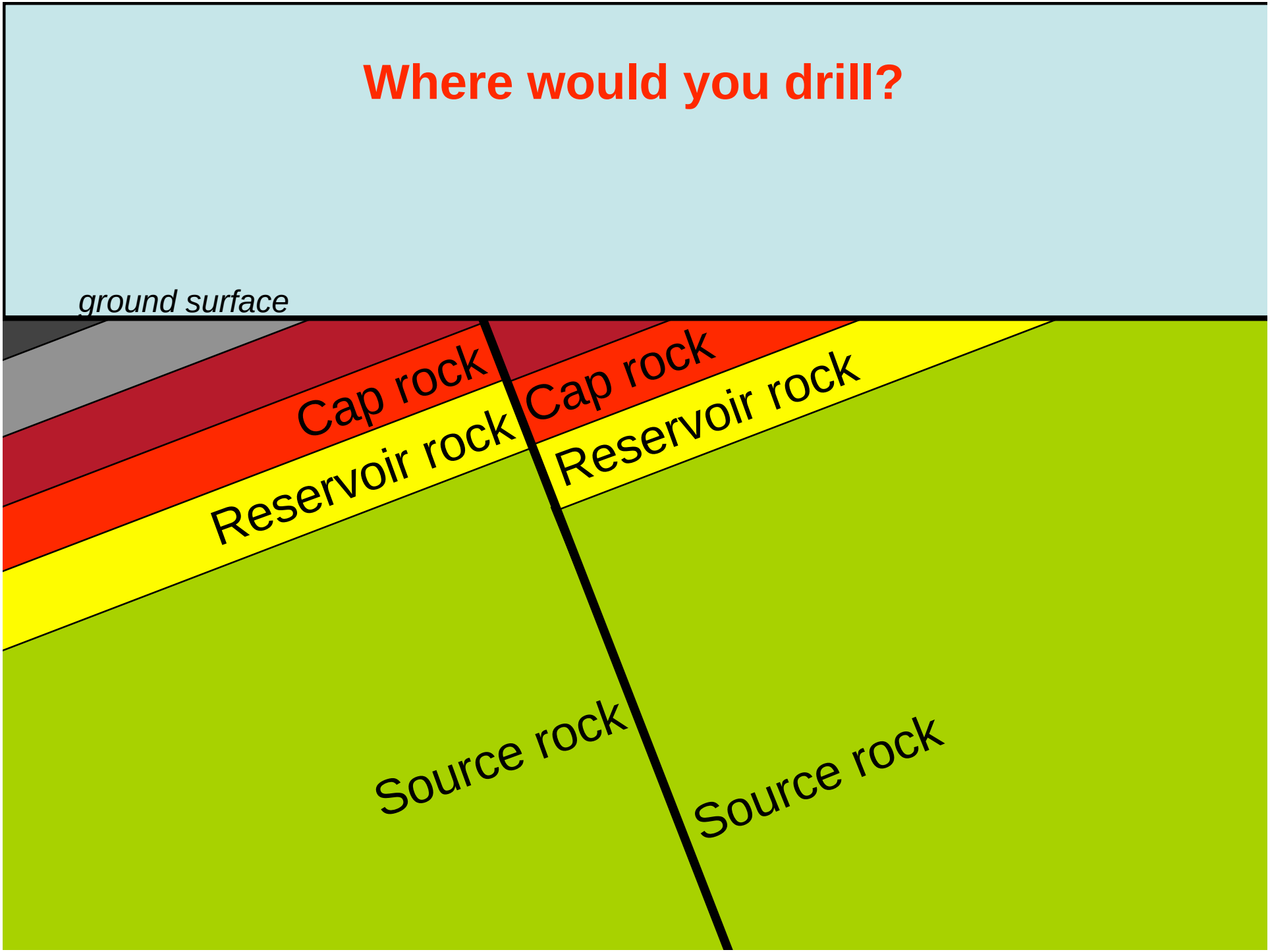


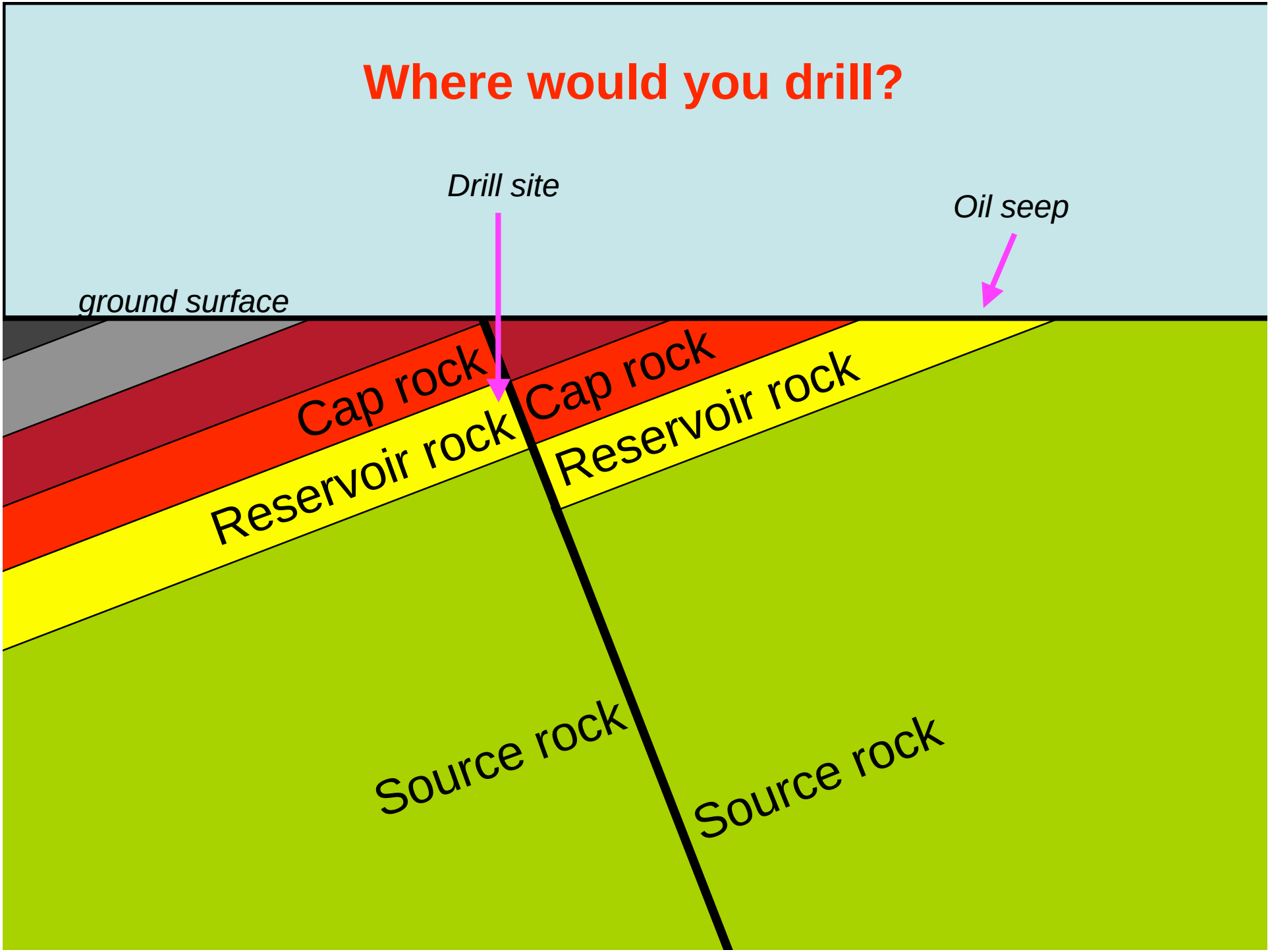





Rivières
MO dissoute
MO particulaire
Nutriments
Productivité primaire (autotrophes)
Nutriments (CO_2, NO_3, PO_4^{3-})
Bactéries + Hétérotrophes
Eau
MO particulaire
MO dissoute
Flocks
Sédimentation
Resuspension
H_2S
Condensation
Kérogène
Sédiment
Tps, T°
+
Tps, T°
+
Gaz
Riboulleau (2000)

Where would you drill?




Where would you drill?
Drill site
Oil seep
ground surface
Cap rock
Reservoir rock
Cap rock
Reservoir rock
Source rock
Source rock

Detrital Sedimentary Rocks

ClasticTexture (particle size)		Sediment Name	Rock Name
Coarse (over 2 mm)		Gravel (Rounded particles)	**Conglomerate**
		Gravel (Angular particles)	**Breccia**
Medium (1/16 to 2 mm)		Sand (If abundant feldspar is present the rock is called **Arkose**)	**Sandstone**
Fine (1/16 to 1/256 mm)		Mud	**Siltstone**
Very fine (less than 1/256 mm)		Mud	**Shale**







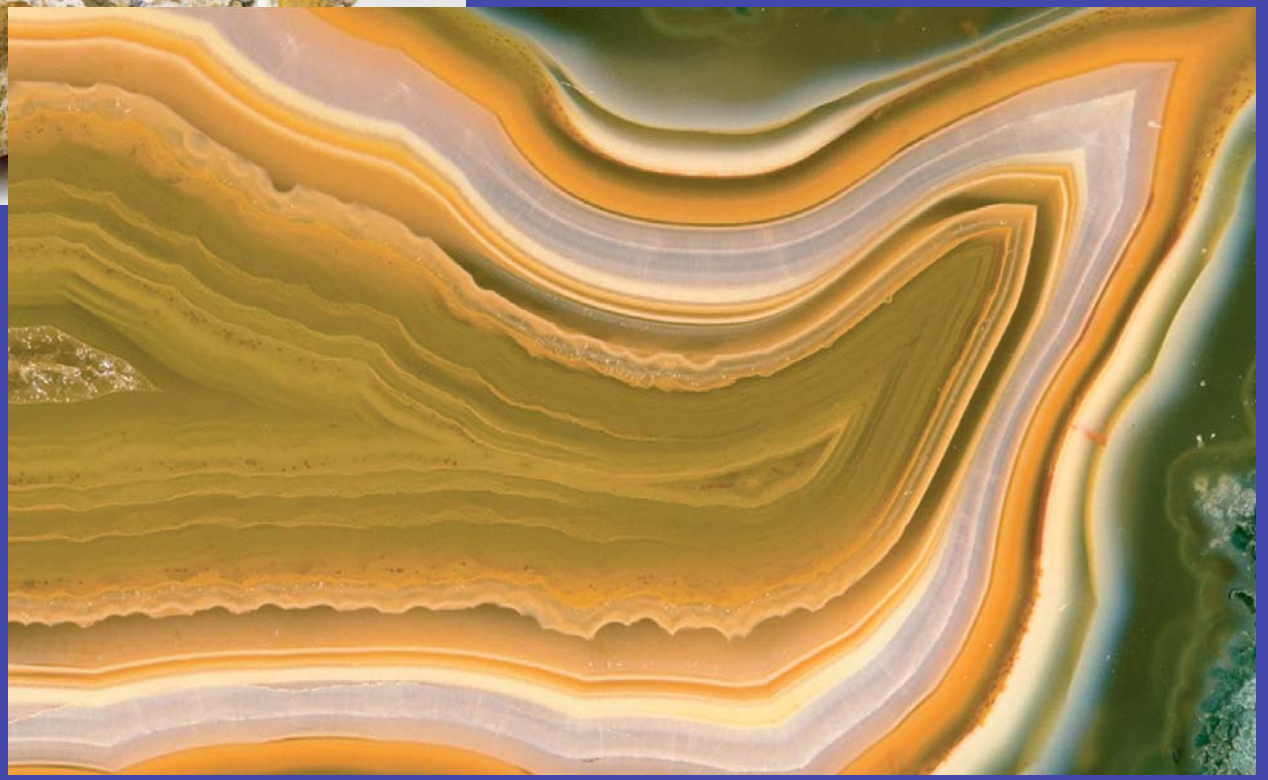




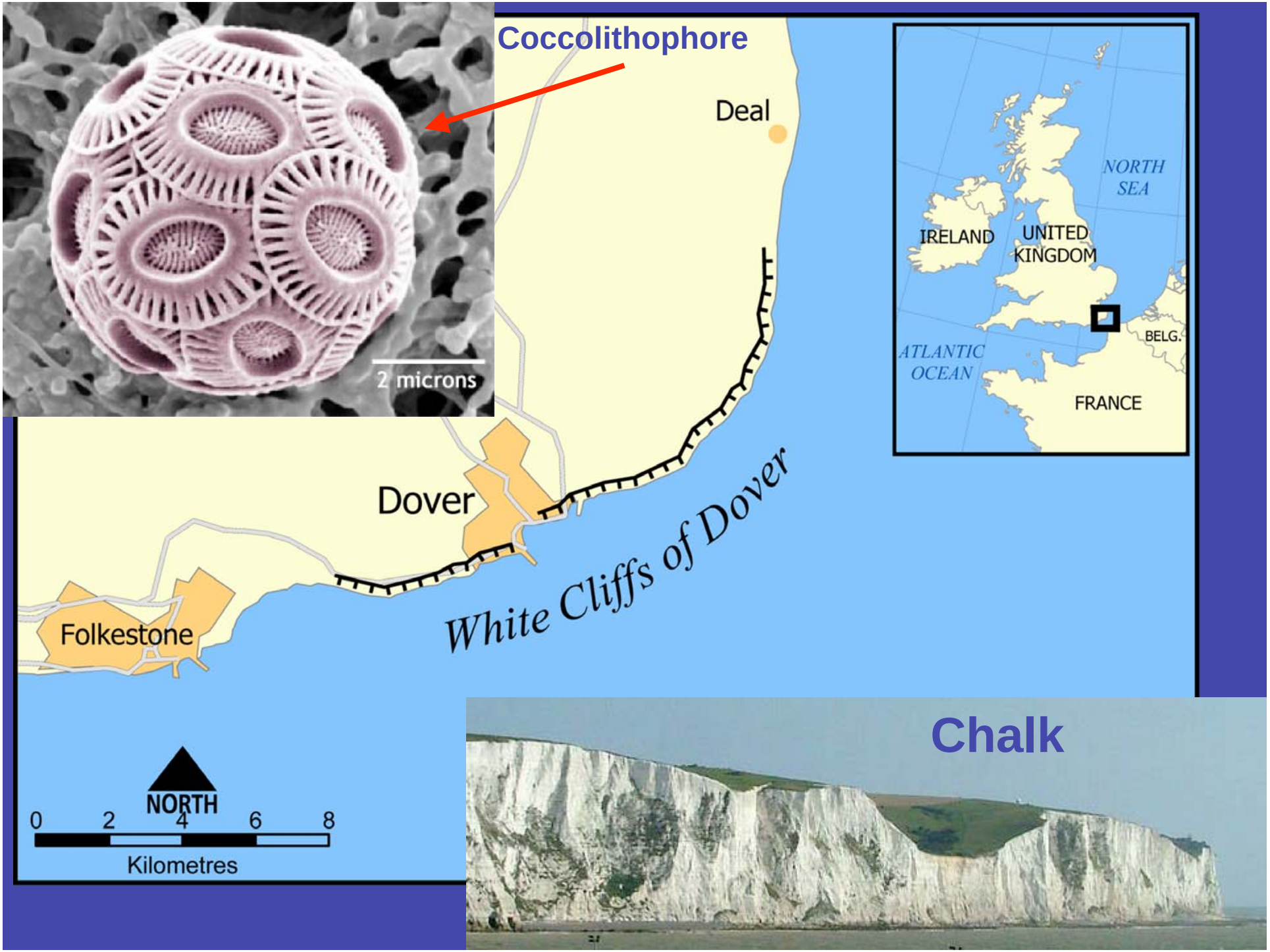
Detrital

(Latin *detritus* “to wear away”)

Chemical



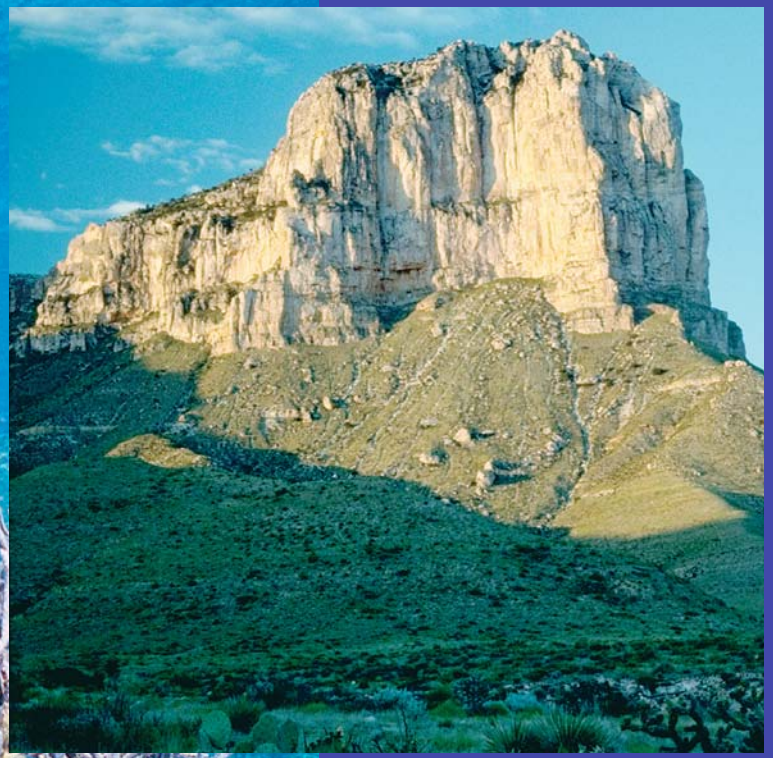



Coccolithophore
2 microns
Deal
Dover
Folkestone
White Cliffs of Dover
NORTH SEA
IRELAND
UNITED KINGDOM
BELG.
ATLANTIC OCEAN
FRANCE
NORTH
0 2 4 6 8
Kilometres
Chalk







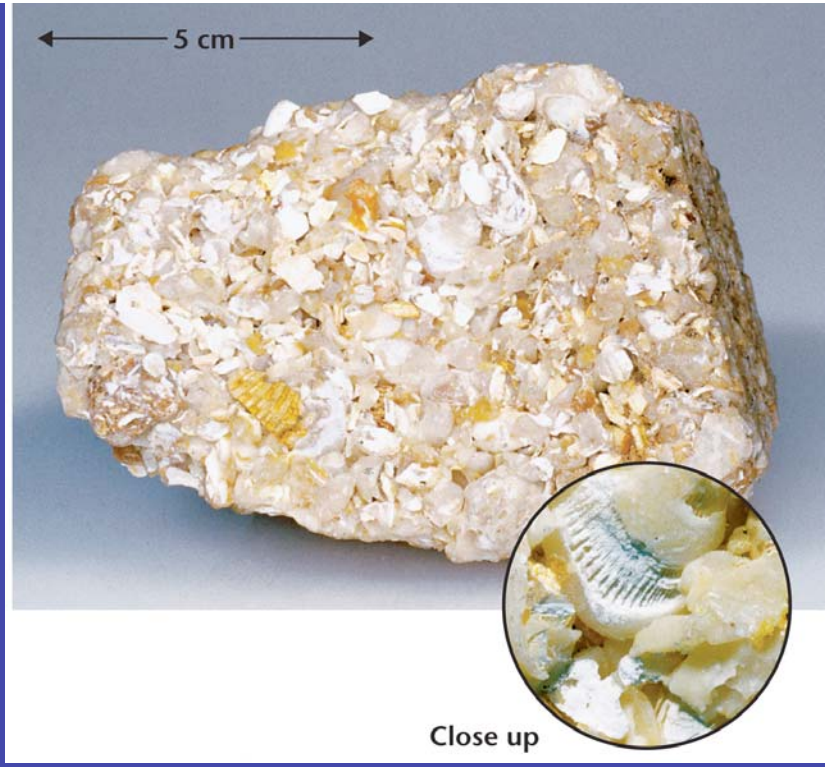


Coral Reef

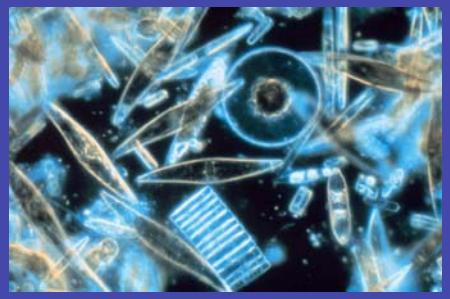
Biochemical Sedimentary Rocks

Limestones ($CaCO_3$)

1. Coral Reefs
2. Coquina
3. Chalk



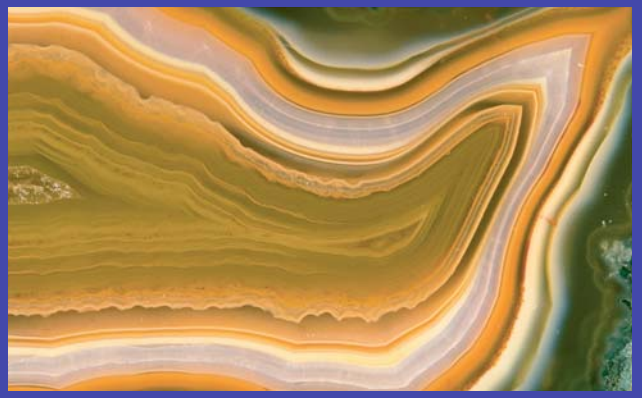
Chert (SiO_2)



1. Flint
2. Jasper
3. Agate










Great
Salt
Lake
OR
ID
CA
NV
Salt Lake
City
Bonneville
Salt Flats
UT
AZ

Salt flats







Gypsum $CaSO_4 \cdot 2H_2O$



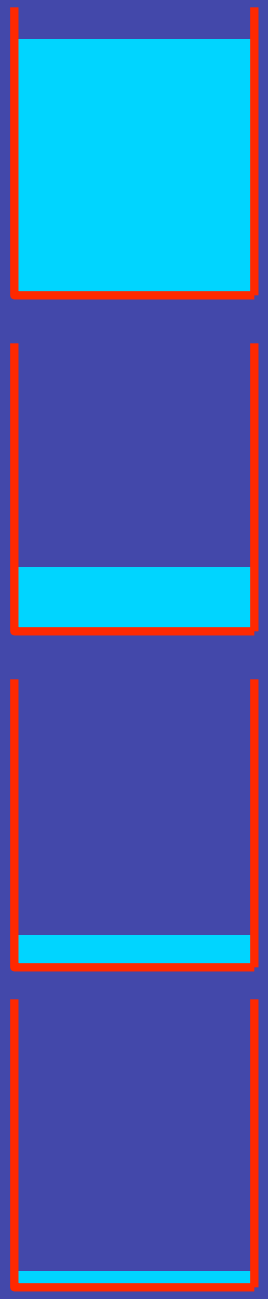
Chemical Sedimentary Rocks -

Evaporites





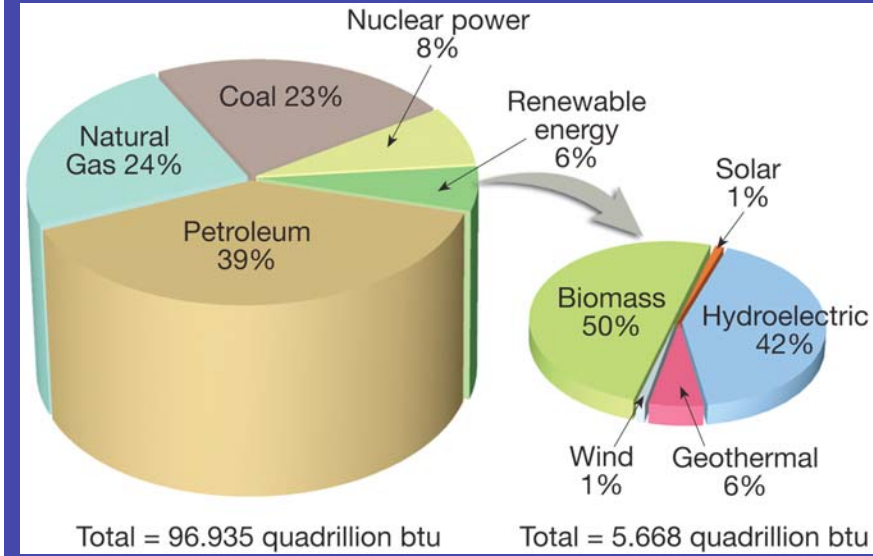


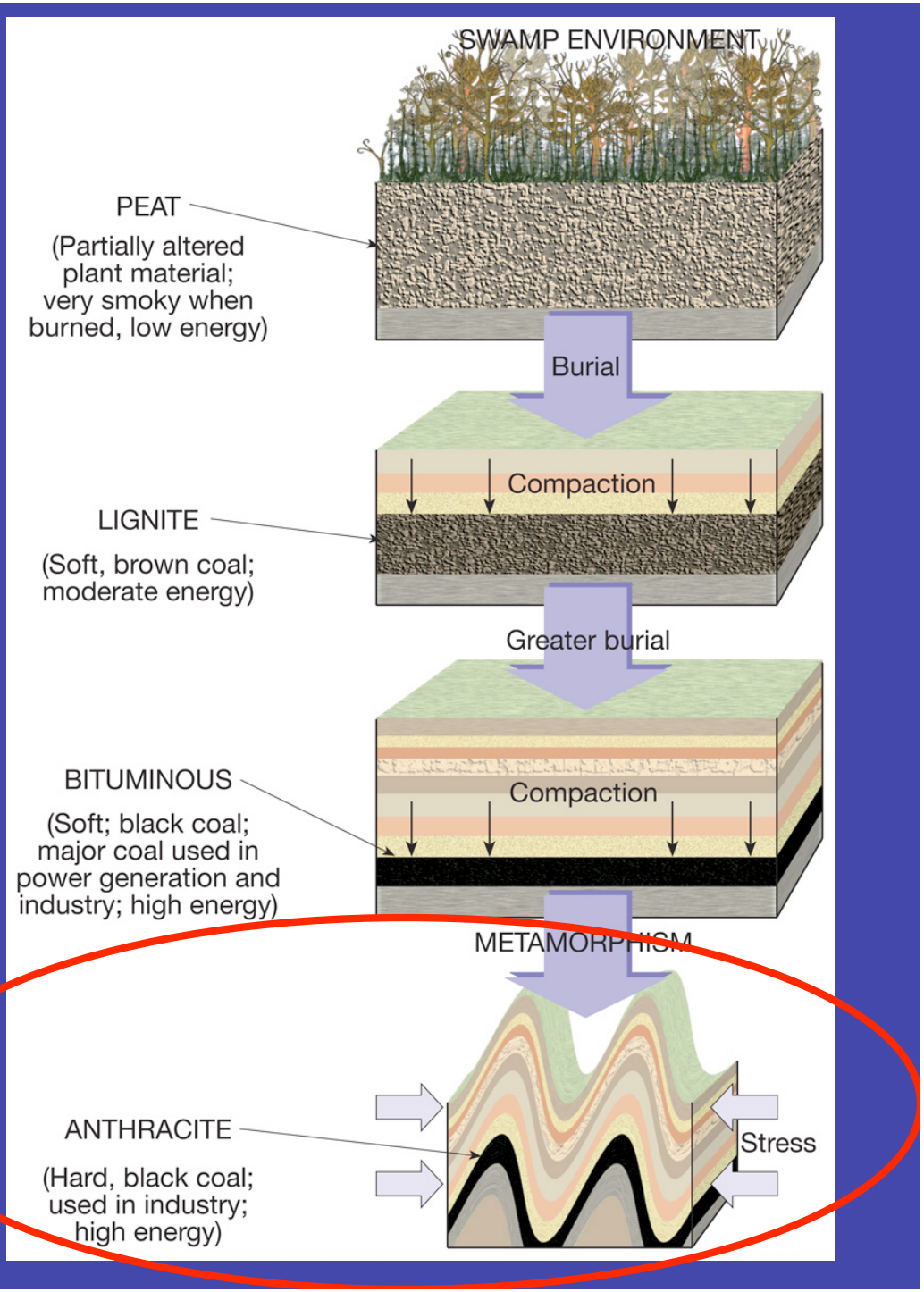




Chemical Sedimentary Rocks – Organic origin

Coal

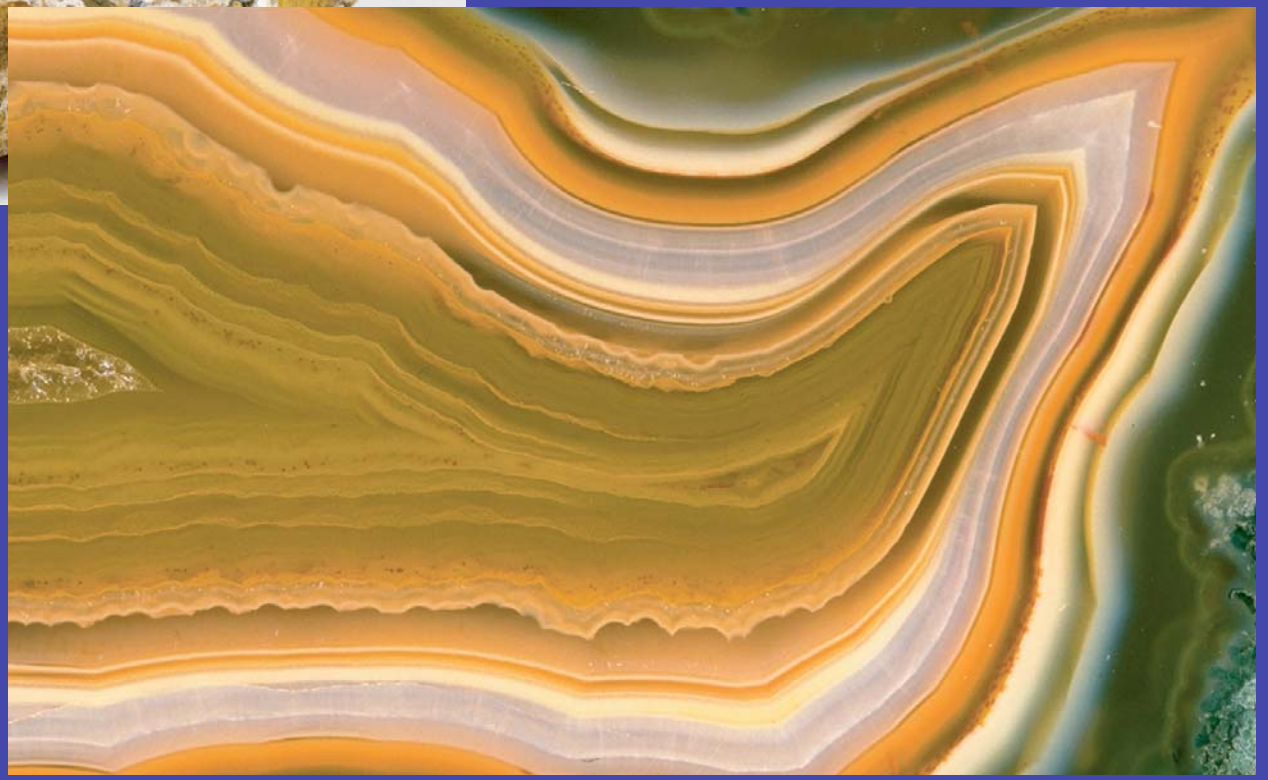






Detrital

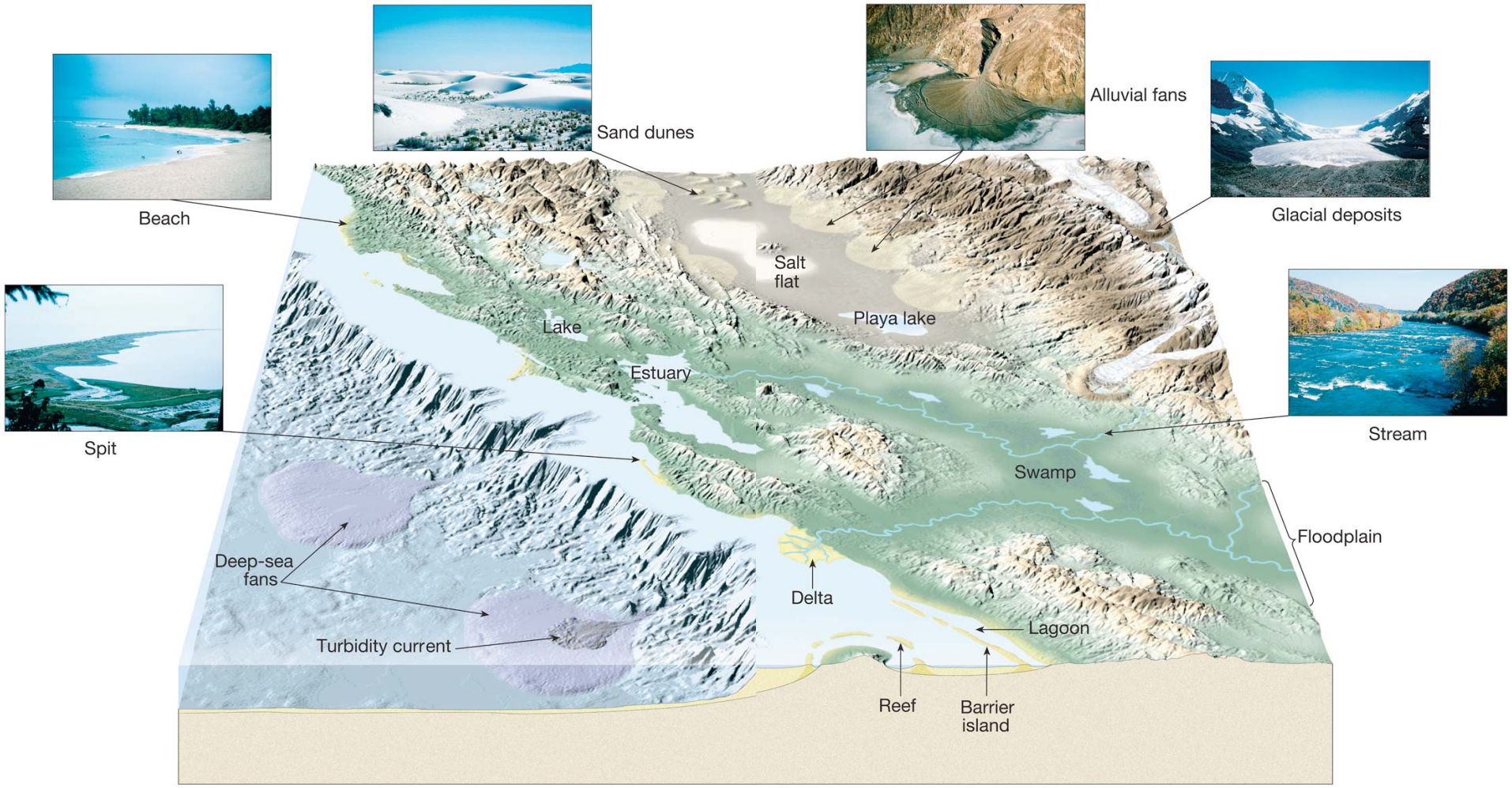
Shale
Siltstone
Sandstone
Breccia
Conglomerate



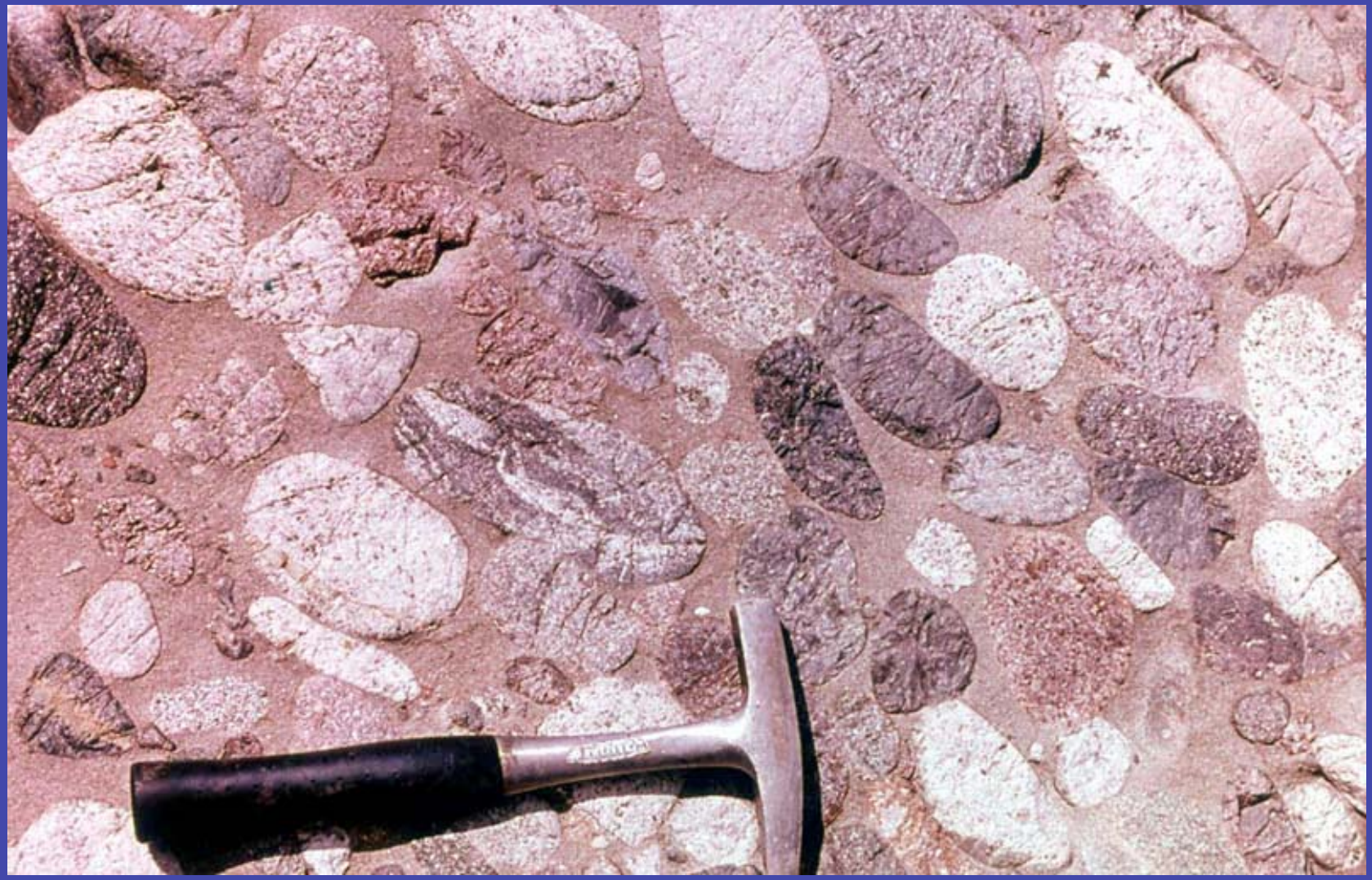
Chemical

Biochemical
Evaporites
Organic

What would each of these rocks look like?




Victoria Falls, Zimbabwe / Zambia



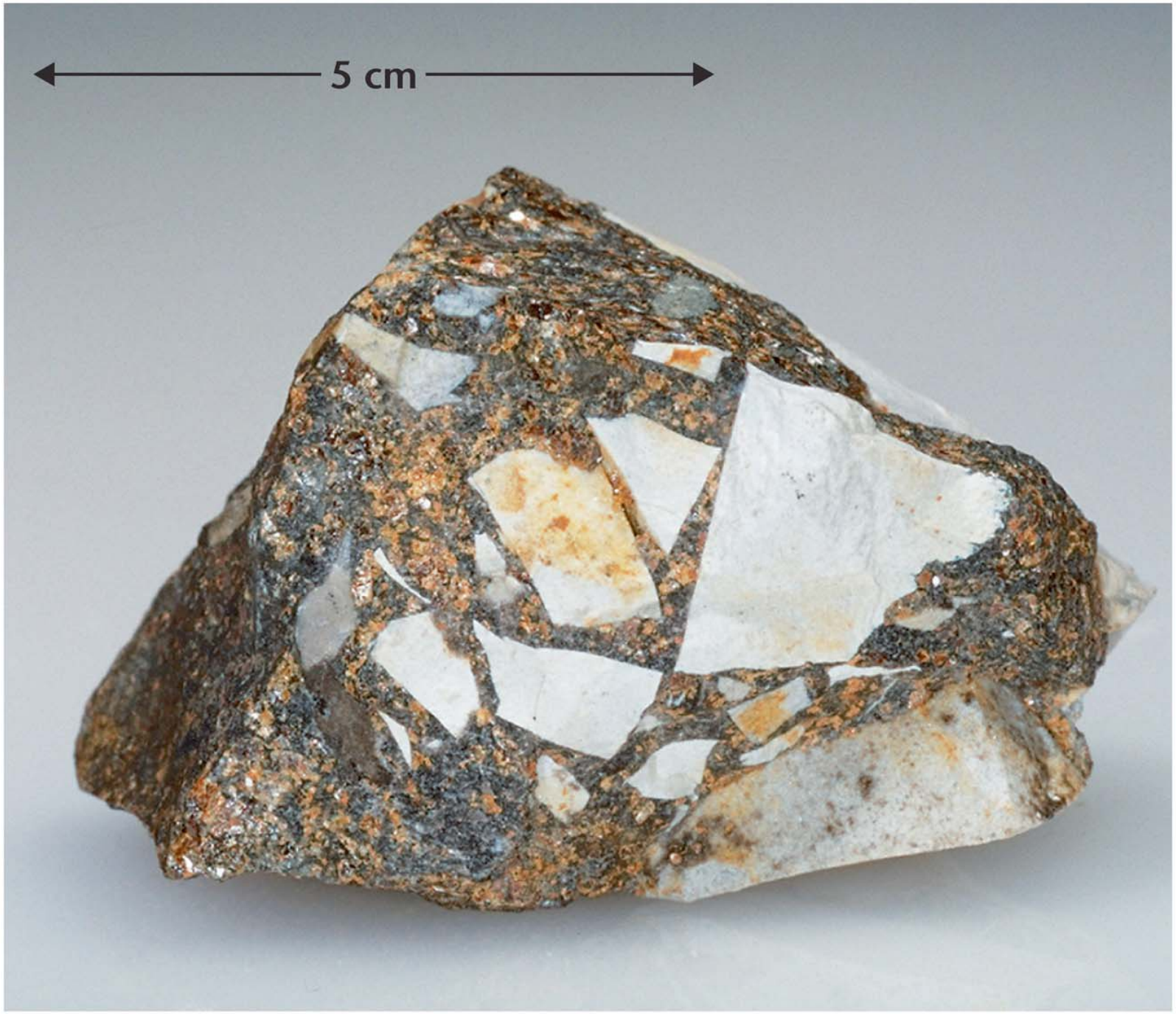


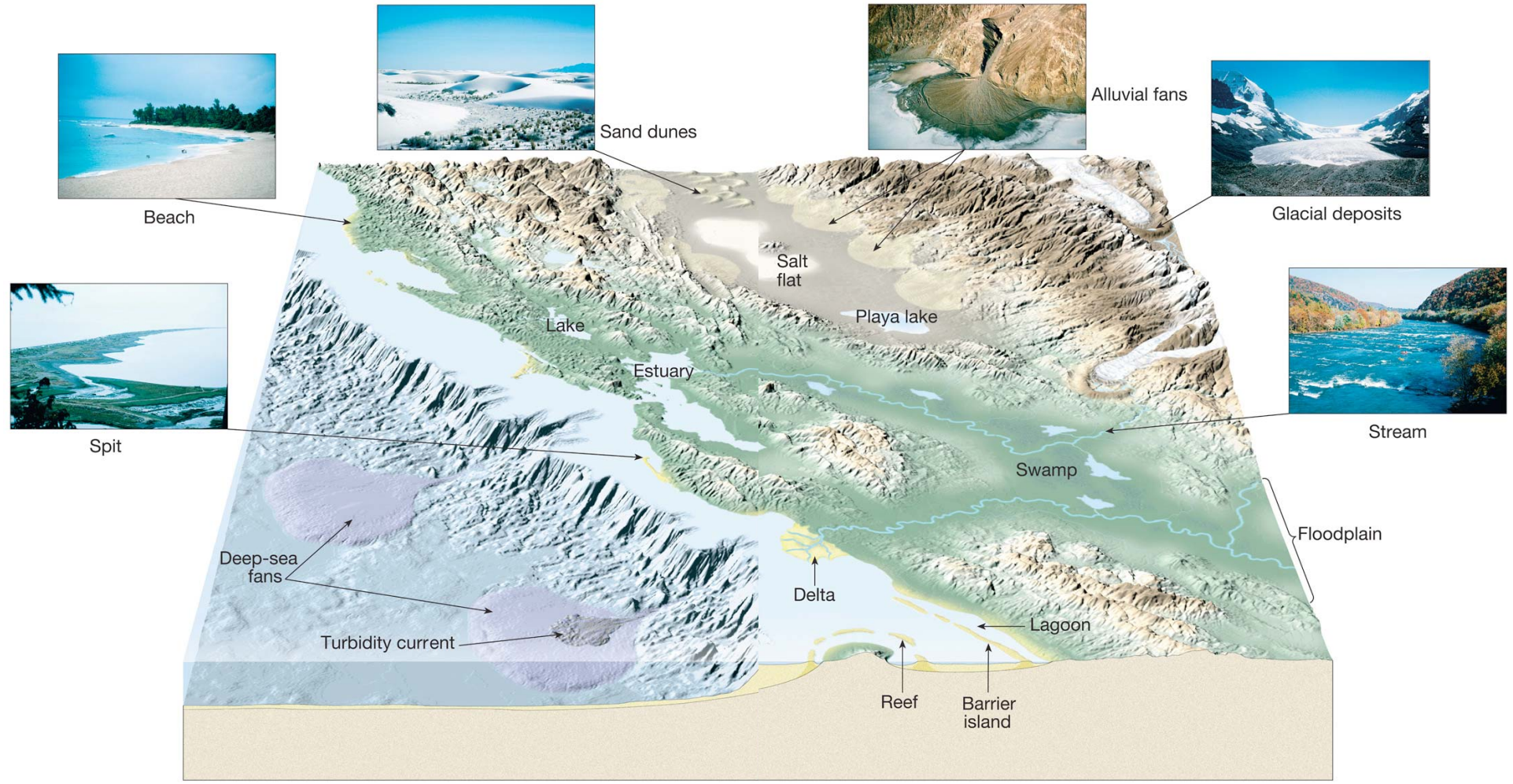









5 cm

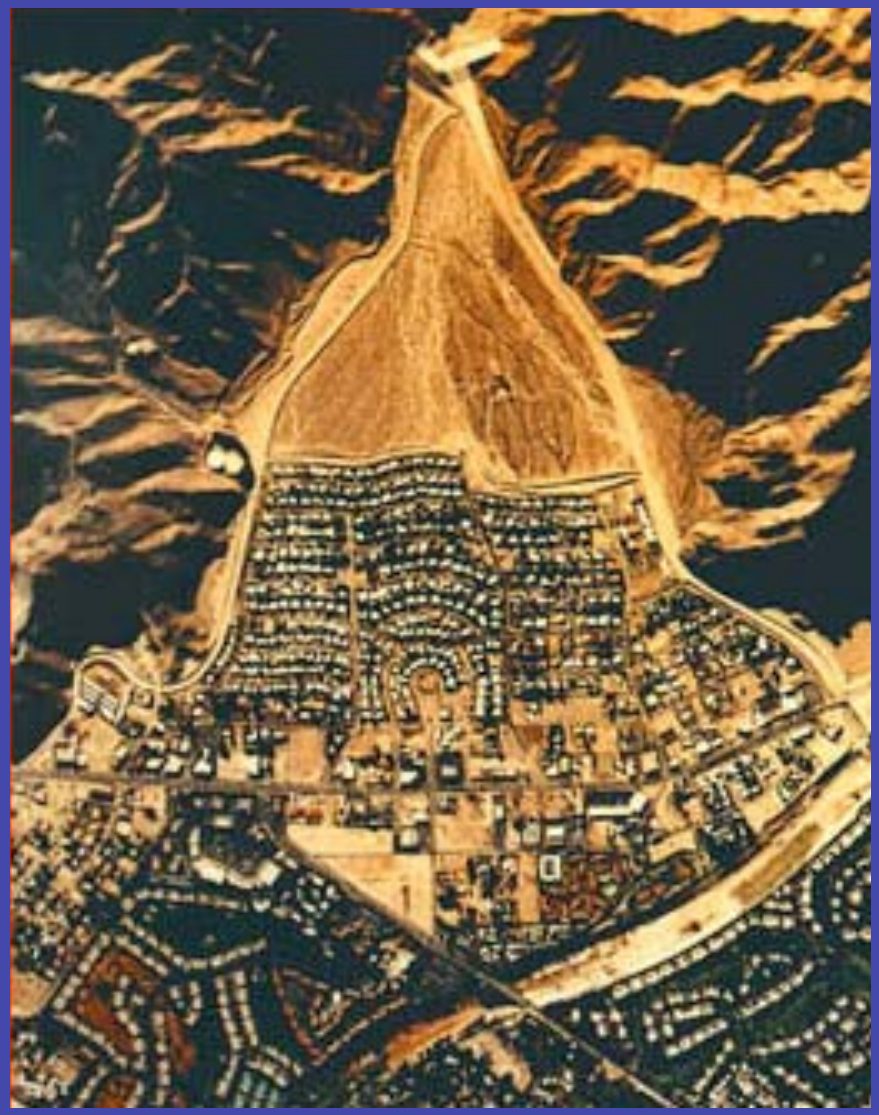

Beach
Sand dunes
Alluvial fans
Glacial deposits
Spit
Salt flat
Playa lake
Lake
Estuary
Stream
Swamp
Floodplain
Deep-sea fans
Turbidity current
Delta
Lagoon
Reef
Barrier island



Fanglomerate

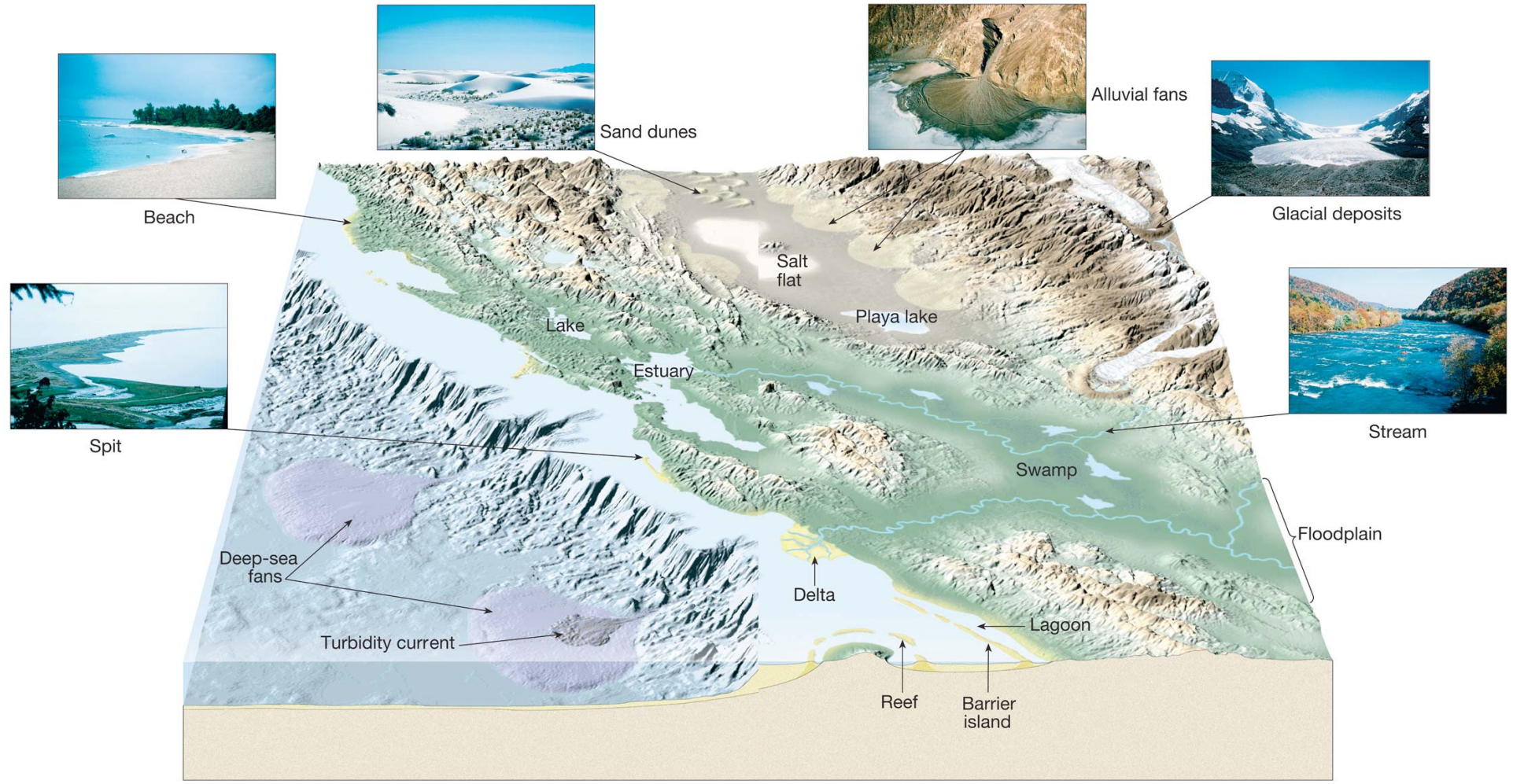


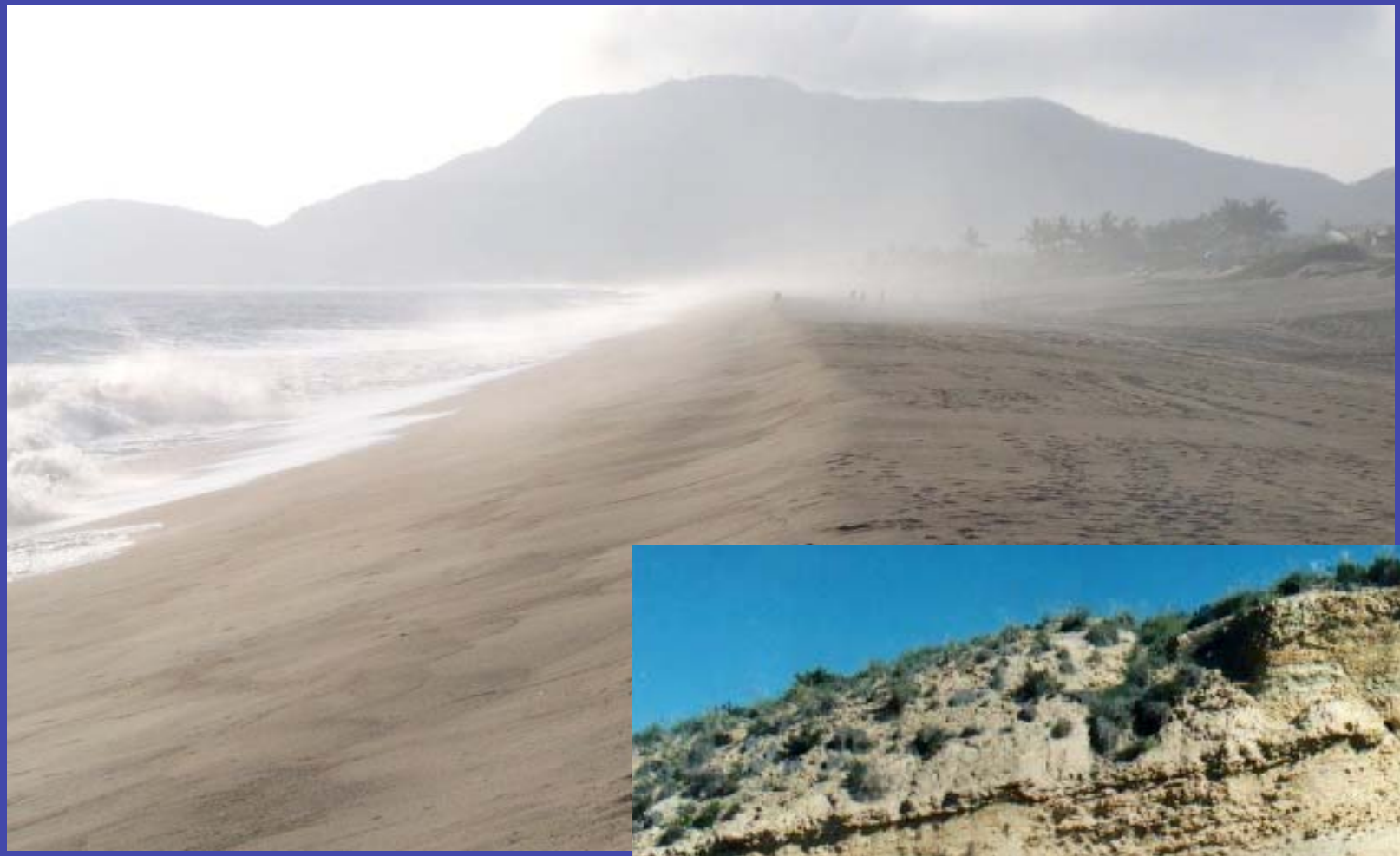
What’s wrong with this picture?



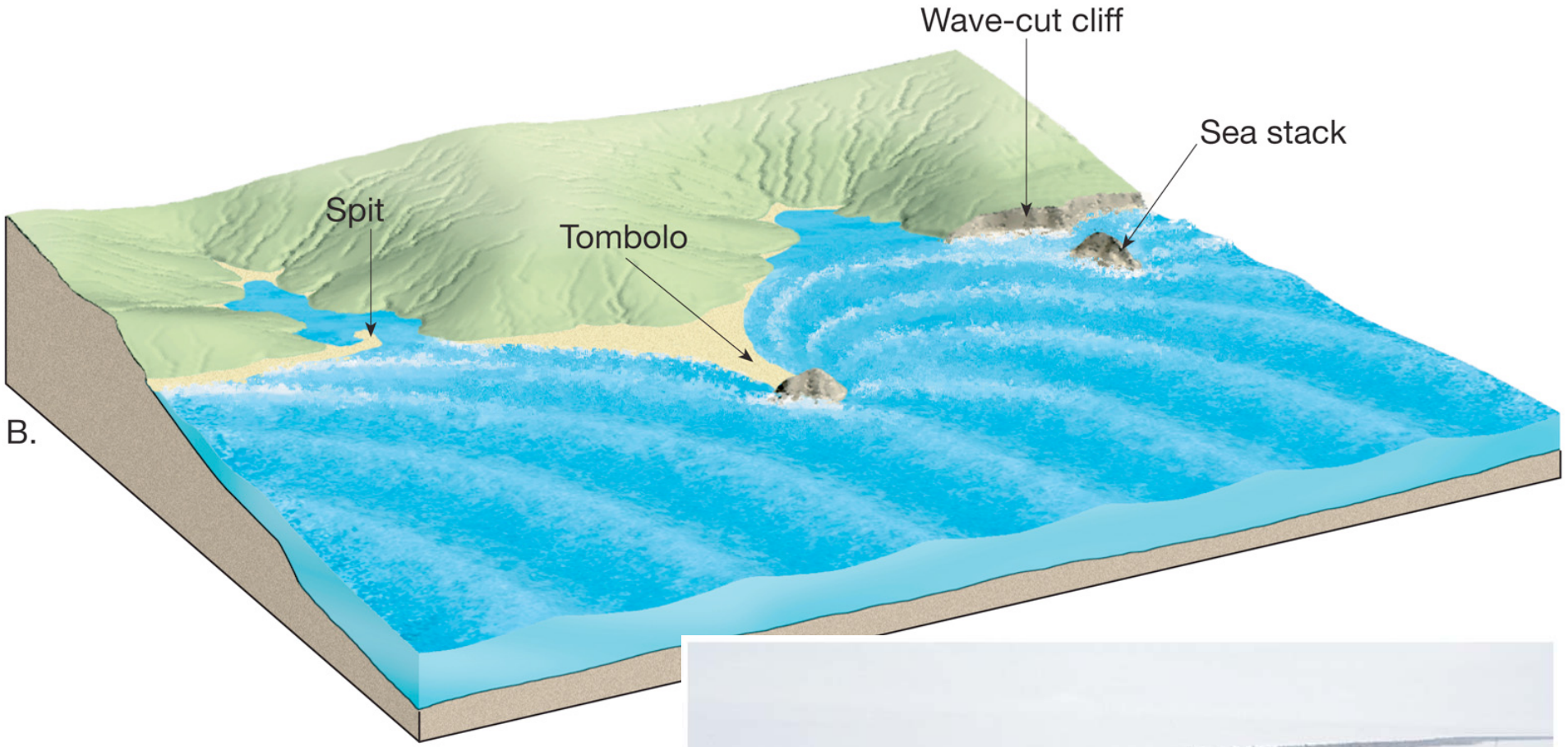


Sand dunes


Beach
Sand dunes
Alluvial fans
Glacial deposits
Spit
Salt flat
Playa lake
Lake
Estuary
Stream
Swamp
Floodplain
Deep-sea fans
Turbidity current
Delta
Lagoon
Reef
Barrier island



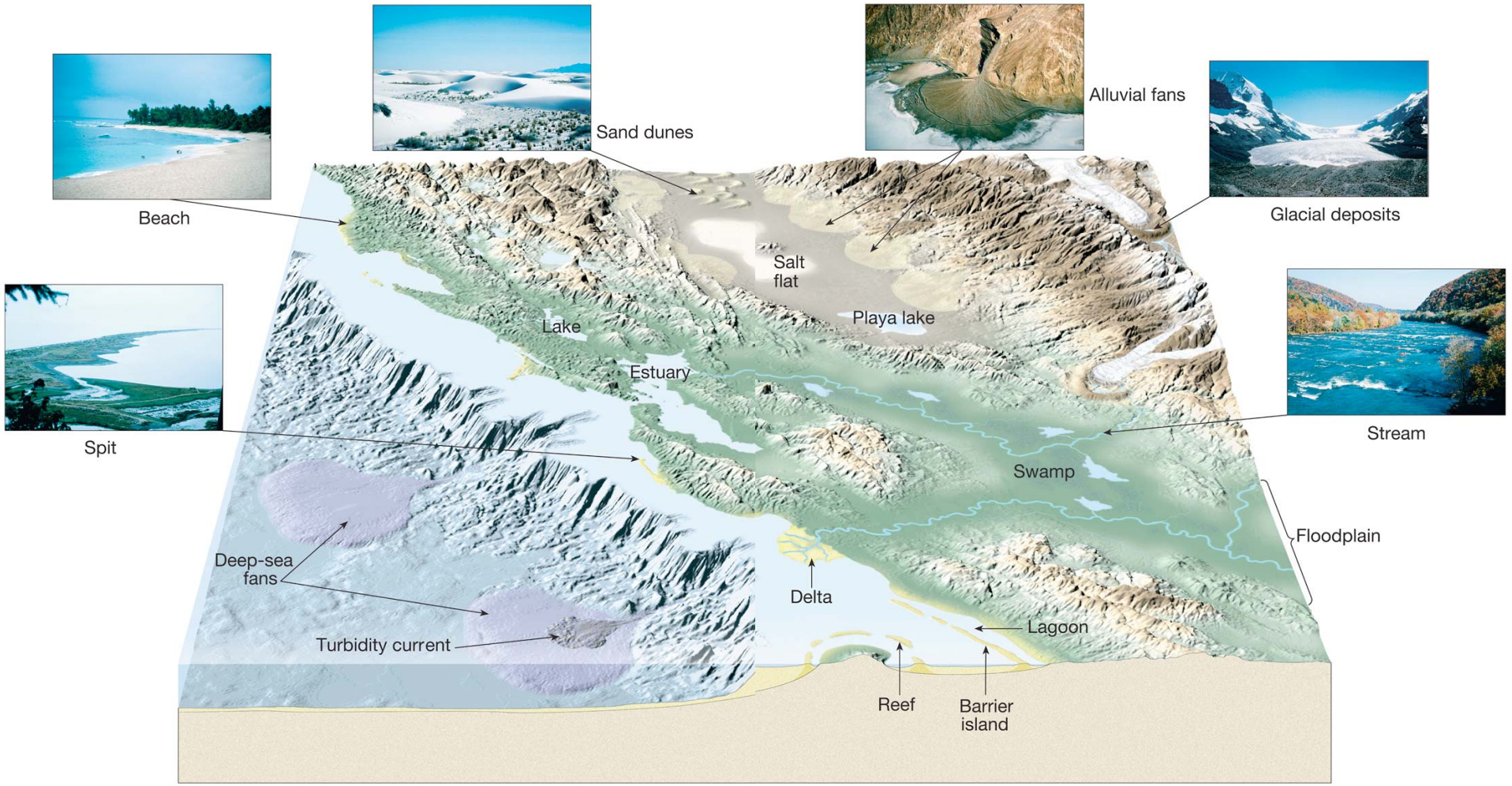


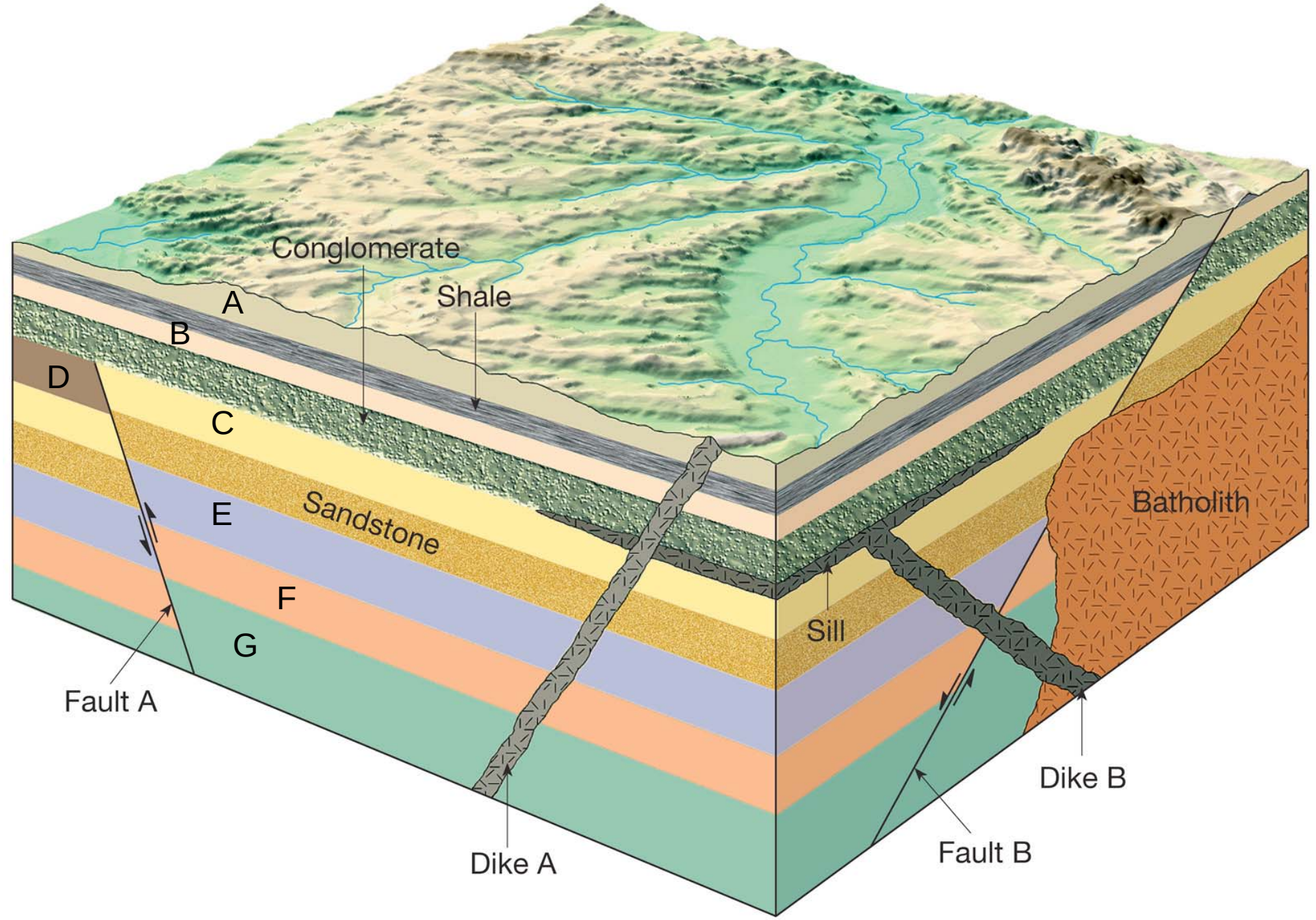

Wave-cut cliff
Sea stack
Spit
Tombolo
B.





Sedimentary rocks record the environment of their formation




Conglomerate
Shale
A
B
D
C
E
Sandstone
F
G
Fault A
Dike A
Sill
Batholith
Dike B
Fault B