

# *FOSSIL FUELS AND SEDIMENTARY ROCKS*

Reading: Earth Science

Tarback and Lutgens

Chapter 3: pages 52-54, 61-69

# ***ES 105 Lab***

Week of February 6-10 (next week)

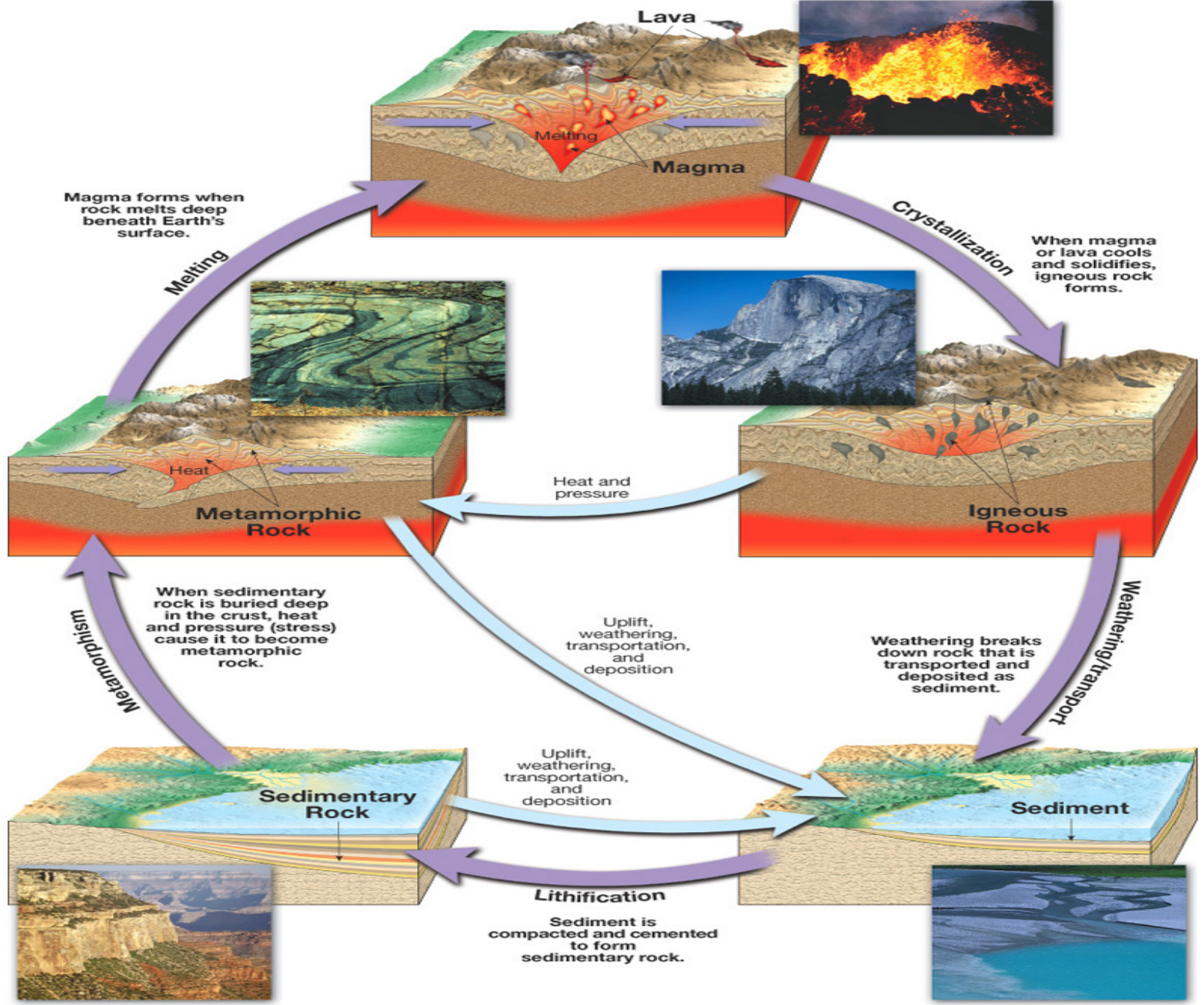
Lab Classroom NS 116

Read Appendix of Lab Manual

Must have completed 'Safety Agreement' for your lab instructor before beginning this lab. (Prelab 3)

# ***Rock cycle***

- Igneous
- Sedimentary
- Metamorphic



# ***Sedimentary rocks***

About 75% of all rock outcrops on the continents

Important to reconstruct much of Earth's history

Sediment is derived from weathering

# ***Weathering***

- Mechanical
- Chemical

# ***Mechanical Weathering***

- Breaks into smaller pieces
- Frost most important agent

# ***Chemical Weathering***

- Equilibrium with conditions
- Forms new minerals and releases ions to solution
- Oxidation, acidosis
- Enhanced by mechanical weathering



# ***Sedimentary rocks***

Two main types

- Rocks formed by deposition of sediment—  
Clastic (or detrital)
- Rocks formed by precipitation from water--  
Chemical (includes rocks formed by organisms)

# ***Sediment clasts***

- Particle loosened from pre-existing rock
- Transported and rounded to place of deposition
- Shape, size, and sorting of clasts can tell about the environment of deposition

# ***Lithification***

## **Process of becoming stone**

- Burial and compaction
- Precipitation of cement
- Each reduces 'pore space'

# ***Cement***

- Brought in by water
- Mineral material between clasts
- Fills in pore spaces
- Commonly calcite, silica, and sometimes iron oxide

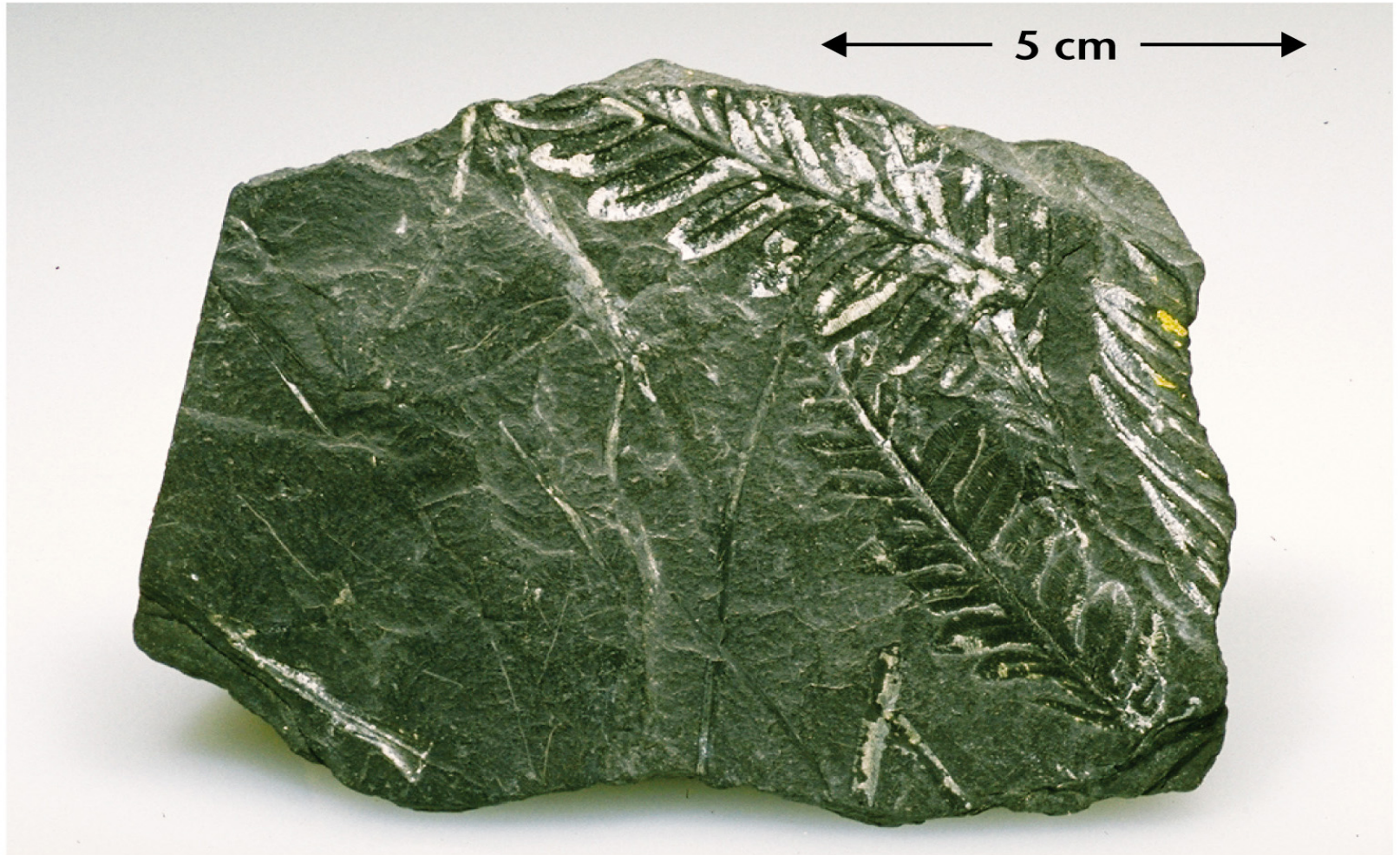
# ***Types of Clastic Rocks***

- Shale (most abundant)
- Sandstone
- Conglomerate

# ***Shale***

- Composed of very fine grained sediment
- Shows obvious tendency to split along planes (fissile)
- Usually gray
- Most common type of sedimentary outcrop

# *Shale with plant fossils*



**D**

# ***Sandstone***

- Composed of sand-size particles
  - Between 1/16 mm and 2 mm diameter
  - Particles may be individual mineral grains or rock fragments
  - Quartz most common type of grain
- Environments include
  - Beach,
  - river,
  - shallow sea,
  - sand dunes



# ***Sandstone***



C

# ***Conglomerate***

- Composed of particles larger than 2 mm
- Usually particles are rock fragments
- When describing conglomerate, refer to shape of the clasts it is composed of, not the overall shape of the rock



# ***Conglomerate***



**A**

# ***Detrital (clastic) rocks***

- Shale is the most common one
- Made from solid particles
- Classified by particle size

# ***Chemical rocks***

Material was once in solution and precipitates to form sediment

- Directly precipitated as the result of physical processes, or
- Through life processes (biochemical origin)

# ***Chemical rocks***

- Limestone
  - Composed of the mineral calcium carbonate
  - Much of this calcite was precipitated by organisms
- Considered an ‘organic sediment’ if from organisms
- Second most common type of sedimentary rock—most common type of chemical rock



# *Coquina*





**Close up**



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# Fossiliferous limestone







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# ***Chemical rocks***



- Direct mineral precipitation from water
  - Microcrystalline quartz (precipitated quartz) known as chert, flint, jasper, opal or agate
  - Evaporites such as rock salt or gypsum
  - Travertine (calcite) and sinter (silica) from hot spring deposits



# Rock salt



# Classification of sedimentary rocks

Detrital Sedimentary Rocks				Chemical Sedimentary Rocks				
Texture (grain size)		Sediment Name	Rock Name	Composition	Texture (grain size)	Rock Name		
Coarse (over 2 mm)		Gravel (Rounded fragments)	<b>Conglomerate</b>	Calcite, CaCO <sub>3</sub>	Fine to coarse crystalline	<b>Crystalline Limestone</b>		
		Gravel (Angular fragments)	<b>Breccia</b>			<b>Travertine</b>		
Medium (1/16 to 2 mm)		Sand	<b>Sandstone</b>		Visible shells and shell fragments loosely cemented	<b>Coquina</b>	<b>Biohermical</b>	
		(If abundant feldspar is present the rock is called <b>Arkose</b> )						Various size shells and shell fragments cemented with calcite cement
Fine (1/16 to 1/256 mm)	Mud	<b>Siltstone</b>	Microscopic shells and clay		<b>Chalk</b>			
Very fine (less than 1/256 mm)	Mud	<b>Shale</b>			Quartz, SiO <sub>2</sub>			Very fine crystalline
					Gypsum CaSO <sub>4</sub> •2H <sub>2</sub> O	Fine to coarse crystalline	<b>Rock Gypsum</b>	
					Halite, NaCl	Fine to coarse crystalline	<b>Rock Salt</b>	
					Altered plant fragments	Fine-grained organic matter	<b>Bituminous Coal</b>	

# ***Sedimentary rocks***

## Features of sedimentary rocks

- Strata, or beds (most characteristic)
- Bedding planes separate strata
- Fossils

# ***Sedimentary rocks***

## *Features of sedimentary rocks*

- Bedding and bedding planes
- Size, shape and distribution of grain sizes
- fossils

# ***Fossils***

- Traces or remains of prehistoric life
- Are the most important inclusions
- Help determine past environments
- Used as time indicators
- Used for matching rocks from different places



# ***Features of sedimentary rocks***

- Porosity
- Permeability

# ***Sedimentary rocks***

## **Economic importance**

- Coal
- Petroleum and natural gas
- Sources of iron and aluminum