

# Review of Weathering & Erosion

January 7, 2015

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## Today's Outline

- Using our review guide to help us! We will review...
  - The difference between weathering & erosion
  - Mechanical/Physical Weathering
  - Chemical Weathering
  - Monday night's homework question
  - Yesterday's Web Quest
- Practice! We'll each create a concept map relating our major points for weathering & erosion
- If we have time... play a game making use of your weathering and erosion knowledge

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## (1) Weathering vs. Erosion

- **Weathering:** Breakdown of rocks due to physical or chemical changes.
- **Erosion:** Weathered rock (sediments) is carried away by gravity, water, wind and ice.

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## (2) Mechanical Weathering



- Abrasion
- Particles in the wind or water rub against other rocks wearing them down creating a smoother rock

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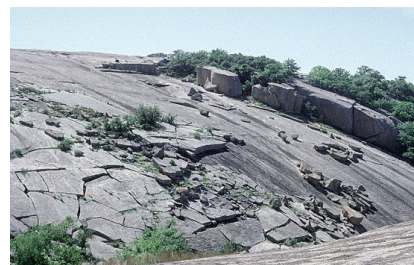
## (2) Mechanical Weathering



- Frost Wedging
- Water enters a crack in the rock, the water freezes and expands, widening the crack in the rock.

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## (2) Mechanical Weathering



- Exfoliation
- Sheets of rock peel off a rock face

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### (2) Mechanical Weathering



- Plant Roots
- Roots grow inside the crack of a rock. As the roots grow in size the pressure exerted cracks the rock further.

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### (3) Chemical Weathering

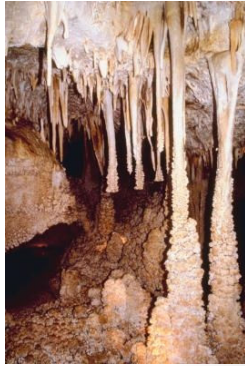


- Oxidation
- Oxygen reacts with minerals (especially those containing iron)

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### (3) Chemical Weathering

Effects on Limestone



- Carbon Dioxide
- A gas that dissolves in water to form carbonic acid (a weak acid)

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### (3) Chemical Weathering

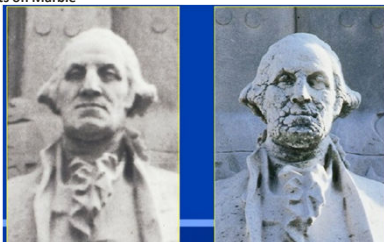


- Hydrolysis
- Water reacts with minerals

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### (3) Chemical Weathering

Effects on Marble



- Acid Rain
- A strong acid that forms with sulfur dioxide and water in the atmosphere

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### Popular Question

- Can acid rain hurt human skin?
- Acid rain does not have an acidic enough pH to burn human skin.
- According to the U.S. Environmental Protection Agency, "Swimming in an acidic lake or walking in an acidic puddle is no more harmful to people than swimming or walking in clean water."
- While acid rain cannot burn your skin, it is linked to several indirect health effects.
- Specifically, sulfur dioxide particles in the air can encourage chronic lung problems, like asthma and bronchitis.

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### (4) Order of Sediment Sizes

- Volunteers?

SEDIMENT COMES IN ALL SIZES			
Large	256 mm and up	BOULDERS	GRAVEL
	64-256 mm	COBBLES	
	2-64 mm	PEBBLES	
Small	0.0625-2 mm	SAND	
	0.002-0.0625 mm	SILT	
	0.002 mm and smaller	CLAY	

### Variables that affect the rate of weathering (Monday's HW)

- #1 Climate – Temperature and moisture levels in an area over a long period of time
  - Cold and wet – Best for Mechanical Weathering (more freezing)
  - Warm and wet – Best for Chemical Weathering (more CO<sub>2</sub> from rich plant life)
- #2 Rock Composition – Soft rocks (limestone) weather faster than harder rocks (granite)

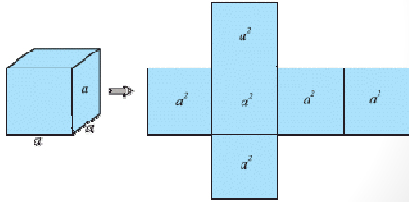
To a lesser extent:

- #3 Surface Area – Greater surface area increases the rate of weathering. Weathering creates more surface area
- #4 Topography – Materials on steep slopes undergo more change

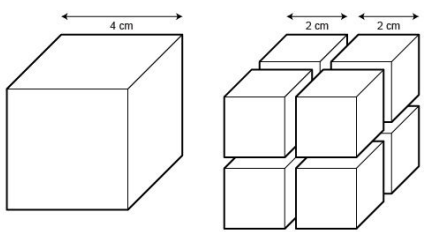
### Surface Area

Surface Area of a Cube =  $6a^2$

where  $a$  is the edge of the cube.



### Which Has Larger Surface Area?



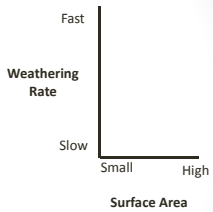
Surface area =  $(4 \text{ cm} \times 4 \text{ cm} \times 6 \text{ faces}) = 96 \text{ cm}^2$

Surface area of one cube =  $(2 \text{ cm} \times 2 \text{ cm}) \times 6 \text{ faces} = 24 \text{ cm}^2$

Total surface area =  $24 \text{ cm}^2 \times 8 \text{ cubes} = 192 \text{ cm}^2$

### Apply It with a Graph!

- Make a graph of the relationship between the rate of weathering and the surface area of a material.
- Plot the weathering rate on the y-axis and the surface area on the x-axis.



### Review Web Quest

1. What are the four agents of erosion?
2. What is deposition?
3. What are deltas and how are they formed?
4. What is contour farming and why do we do it?
5. What is a rain barrel and how is it beneficial?
6. What makes up a buffer strip and how is it beneficial?

## Deposition

- **Deposition** is the final stage in the erosion process in which the transportation of sediment slows down and the sediments are dropped in another location.
- Animation:  
[https://www.classzone.com/books/earth\\_science/terc/content/visualizations/es0604/es0604page01.cfm?chapter\\_no=visualization](https://www.classzone.com/books/earth_science/terc/content/visualizations/es0604/es0604page01.cfm?chapter_no=visualization)

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## Deltas

### The formation of Deltas

This causes bars or islands of sediment to build in the middle of the main channel

River spreads out and slows down as it approaches the sea

Deposition is therefore encouraged as the hydraulic radius drops and the river becomes less efficient, the biggest sediments are dropped first and the finest further away

The river splits into distributaries

The land

Sea or lake

Sea or lake bed

Layers of sediment build the delta out into the sea, as top set, foreset and bottom set beds

By Rob Gamesby

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## Practice! Create a Concept Map

A Concept Map

is composed of

is composed of

identifies

between

Linking Phrases

Relationships

Weathering

Water

Transports sediments

Sediments settle

Deltas

Erosion

Slowing water

Wind

Break down rocks

Chemical

Deposition

Ice

Gravity

Preventing Soil Erosion

Mechanical

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## Sample

Deposition

Weathering

Erosion

When wind or water lose energy, and slows down, sediment can no longer be carried in it, when the sediments settle it is called deposition

Weathering is the natural process that breaks down rock. Some examples are oxidation, ice wedging, and abrasion.

Erosion is when weathered particles move from place to place. Examples: avalanches and waterfalls and earthquakes

One type of weathering is mechanical weathering. It happens when rock is physically broken down into pieces.

Chemical weathering is another type of weathering. Through this process, rock is broken down by chemical changes.

Deposition is the last step in the weathering process.

Weathering is first in the cycle.

Erosion is the second step after weathering.

All three of these steps are connected in that they all are part of the process of breaking down rock, transporting the rock particles, and depositing the rock particles.

## Sample

Earth Processes

destructive forces

constructive forces

Weathering → breaks down rocks → Erosion → transports sediments → Deposition → sediments settle

Erosion is moved by wind, water, ice

Deposition is caused by slowing water or wind

changes environment

positive effects

makes landforms

lakes valley canyons rivers

negative effects

can damage roads increase buildings humans increase problem farming construction

changes environment

positive effects

nutrients to soil makes landforms lakes valley canyons rivers

negative effects

can fill in lakes waterways can carry toxic materials

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## Grudge Ball – Game Rules

- **Winner: Team with the most "X's"**
- Answer a question correctly --- remove two "X's" from the board (but not from your own team!)
- May increase the number of "X's" you remove by making a shot. Score from the 2 point line, remove a total of 4 "X's." Score from the 3 point line, remove a total of 5 "X's".
- Miss your shot? Still get to remove two X's.
- Lose all of your X's? You can still answer questions. To earn X's back you must answer the question right and get a basket.

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