Remote Learning Packet

NB: Please keep all work produced this week. Details regarding how to turn in this work will be forthcoming.

April 20 - 24, 2020

Course: Science

Teacher(s): Mr. Weyrens

Weekly Plan:

Monday, April 20
- ☐ Practice Star-Splitter
- ☐ Review of Topographical Maps
- ☐ Introduction to Weathering, Erosion, and Deposition

Tuesday, April 21
- ☐ Practice Star-Splitter
- ☐ Chemical Formula and Equation Review

Wednesday, April 22
- ☐ Practice Star-Splitter
- ☐ Chemical Weathering Reading and Questions

Thursday, April 23
- ☐ Practice Star-Splitter
- ☐ Mechanical Weathering Reading and Questions

Friday, April 24
- ☐ Practice Star-Splitter
- ☐ Erosion and Deposition Reading
- ☐ Vocabulary Review

Statement of Academic Honesty

I affirm that the work completed from the packet is mine and that I completed it independently.

I affirm that, to the best of my knowledge, my child completed this work independently

_____

Student Signature

_____

Parent Signature

Monday, April 20

- Starting from the very beginning, spend 5-10 minutes reciting the Star-Splitter, trying to recite up to "He took a strange thing to be roguish over" without looking at the poem.
- Complete the review of topographical maps towards the end of the packet.
- Read the Introduction for Weathering, Erosion, and Deposition and take notes. Write the definitions or make flash cards for the bolded words.

Tuesday, April 21

- Starting from "don't call it blamed…" spend 5-10 minutes reciting the Star-Splitter and be sure to get to the line "A good old-timer dating back along;"
- Read through the chemistry review at the end of the packet and complete the questions.

Wednesday, April 22

- Starting from "don't call it blamed…" spend 5-10 minutes reciting the Star-Splitter and be sure to get to the line "Why not regard it as a sacrifice"
- Read through the Chemical Weathering section of "Weathering, Erosion, and Deposition." Write the definitions or make flash cards for the bolded words.
- Answer the following questions on a sheet of notebook paper in complete sentences:
    - What causes chemical weathering?
    - What do you think would make one rock more resistant to chemical weathering than another?
    - Do you think that the observatory in Edinburgh would look green if it were somehow protected from the open air? Explain your answer.

Thursday, April 23

- Starting from "don't call it blamed…" spend 5-10 minutes reciting the Star-Splitter and be sure to get to the line "Instead of a new-fashioned one at auction?"
- Read through the mechanical weathering section of "Weathering, Erosion, and Deposition." Write the definitions or make flash cards of the bolded words.
- Answer the following questions on a sheet of notebook paper in complete sentences:
    - Why do you think that weathering occurs more in warm and wet weather?
    - What might make one rock more resistant to physical weathering than another?

Friday, April 24

- Starting from the very beginning, spend 5-10 minutes reciting the Star-Splitter, trying to recite up to “Instead of a new-fashioned one at auction?” without looking at the poem.
- Read through the Erosion section and the Deposition section of “Weathering, Erosion, and Deposition.” Write the definitions or make flash cards of the bolded words.
- Use the flashcards or your notes to practice the definitions from all the bolded words for 5-10 minutes.

Weathering, Erosion, and Deposition

Introduction

The Earth's crust is constantly changing; it changes at different rates in different places and at different times, but it is always changing to some extent. We learned previously about how plate tectonics, caused by convection currents in the asthenosphere, creates landforms such as mountains and volcanoes. Forces which build up landforms in this way are called constructive forces.

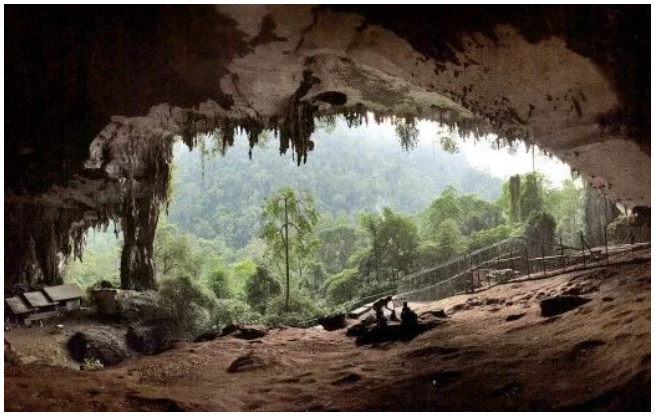
There are also forces which break down and destroy landforms, and they are called destructive forces. One such destructive force is called **weathering**. Weathering is any process which breaks down rocks into smaller pieces called sediments. When this happens, other forces can come along and carry the sediments away from their original location. The process of carrying sediments from one place to another is called **erosion**. Those sediments will eventually settle down somewhere else in a process called **deposition**. Through the week we will be looking at these processes more in depth and show what changes they can effect or cause on the Earth's crust.

Several factors affect the rate at which weathering occurs. The first is the type of rock or substance being weathered; some rocks are more resistant to certain kinds of weathering than others. The second factor is the climate; warmer and wetter weather causes more weathering. Lastly, the surface area of the exposed rock affects the rate of weathering; a rock with a larger exposed face will weather faster than a rock with little exposure to the elements.

Chemical Weathering

There are two kinds of processes which can cause weathering. The first one we will look at are chemical processes. Chemical Weathering occurs when chemical reactions occur and change the chemical composition of the compounds in the rock. Recall that a chemical reaction is a process in which substances undergo chemical changes; that is, it is a process in which the atoms in a substance are rearranged to form a new substance. For instance, the process of photosynthesis takes water, carbon dioxide and sunlight and changes it into glucose (a type of sugar) and oxygen.

The most common types of chemical reactions which cause weathering are carbonation, oxidation, and acid rain. **Carbonation** is the process by which carbon dioxide is dissolved, often in water. This process makes water slightly acidic (which is why sparkling water has a slightly sour taste to it; acids taste sour). The slightly acidic water can then eat through rocks such as limestone. This kind of weathering can form fractures and, given enough time, caves (such as this one in Malaysia):



The chemical reaction involved looks like this:

$$CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$$

Calcium Carbonate in the limestone ($CaCO_3$) reacts with carbon dioxide (CO_2) and water (H_2O) to form calcium bicarbonate [$Ca(HCO_3)_2$]. The calcium bicarbonate that is formed is dissolved in the water, so the calcium carbonate is "broken off" in a sense from the main piece of limestone by being converted into a new substance.

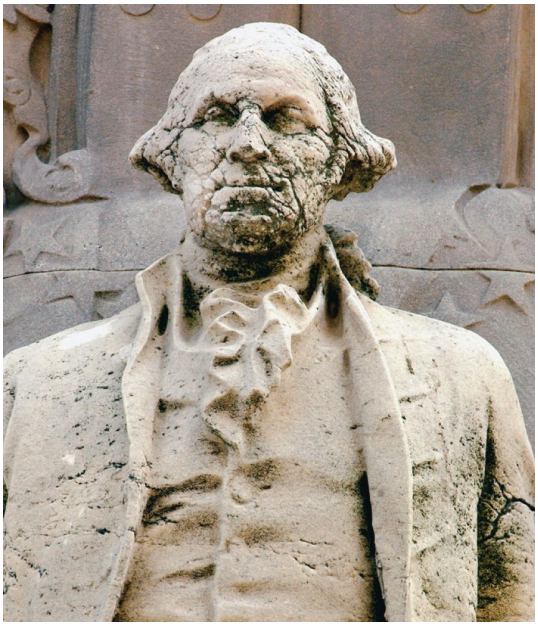
Oxidation is a type of chemical reaction in which a substance loses electrons, often by reacting with oxygen. The most common type of oxidation, with which you might be familiar, is the formation of rust on iron and other substances. When oxygen reacts with iron, it forms the brittle compound iron oxide. Iron oxide (Fe_2O_3) is weak and prone to breaking apart, so this kind of weathering is conducive to further weathering by physical or mechanical means. The reaction for the oxidation of iron looks like this:

$$4Fe + 3O_2 \rightarrow 2Fe_2O_3$$

Iron oxide is reddish in color, and this is what gives some rocks the brownish-red color that they have. The following image was taken from Karijini National Park in Australia:

A similar process happens with copper. Copper oxide looks green, so rocks with copper in them will sometimes appear green if exposed to the open air. Here is the Observatory in Edinburgh, which has domes made of copper:

Acid rain is formed when sulfur or nitrogen compounds in the air are dissolved in water. This causes precipitation to become somewhat acidic and to break down the substances that it comes into contact with. Rocks tend to slowly dissolve over time if they are consistently in contact with acid rain. This has occurred to this marble statue of George Washington:



Mechanical Weathering

Mechanical weathering (also called physical weathering) is the process by which rocks are physically broken apart rather than being broken down in chemical reactions. This can occur in a number of different ways. For instance, sand being carried by the wind or by water can rub abrasively against rock to break it apart (think about what happens to your skin if you rub sand against it). This can happen slowly, such as what happens when sand is moved by ocean currents, or very quickly, such as when sand is moved by fast winds in a sandstorm.

Another example is when plants grow up through cracks or their roots wedge themselves into rocks underground. Animals, especially burrowing animals, also cause weathering. A third example is that of water freezing and melting. Remember that water expands when it freezes. When water fills a fracture and then freezes, it forces the fracture to grow. The water can then melt so that the now widened fracture can be filled with water again. This process also can widen existing fractures in rocks and is called **freeze-thaw** Water can also cause weathering through repeatedly pounding into the rock faces on the coasts.

Another way that mechanical weathering can occur is through a process called **exfoliation**. This is when repeated heating and cooling causes the rock to expand and contract. The rock eventually begins to flake off, like the outside of an onion.

Erosion

Erosion is the process by which substances already broken apart by weathering are moved from one location to another. There are various forces which can do this:

- Moving water, such as rivers, streams, tides, and rain water
- Wind
- Gravity, such as what happens in landslides and mudslides
- Glaciers, which pick up small rocks beneath them as they move.

Urban development can also increase the rate of erosion, as paved roads and other urban features prevent water from seeping into the ground; this causes there to be more flooding, and thus more erosion.

As erosion occurs, the sediments that are carried can cause mechanical weathering. Erosion and weathering thus often occur at the same time. This results in sediment that has been carried a long

distance being smaller and more round (more weathered) and sediment which has been carried a short distance to be larger and more angular (less weathered). As these sediments are carried away, the elevation of a particular area decreases. Rivers can become wider or deeper through this process as well.

Deposition

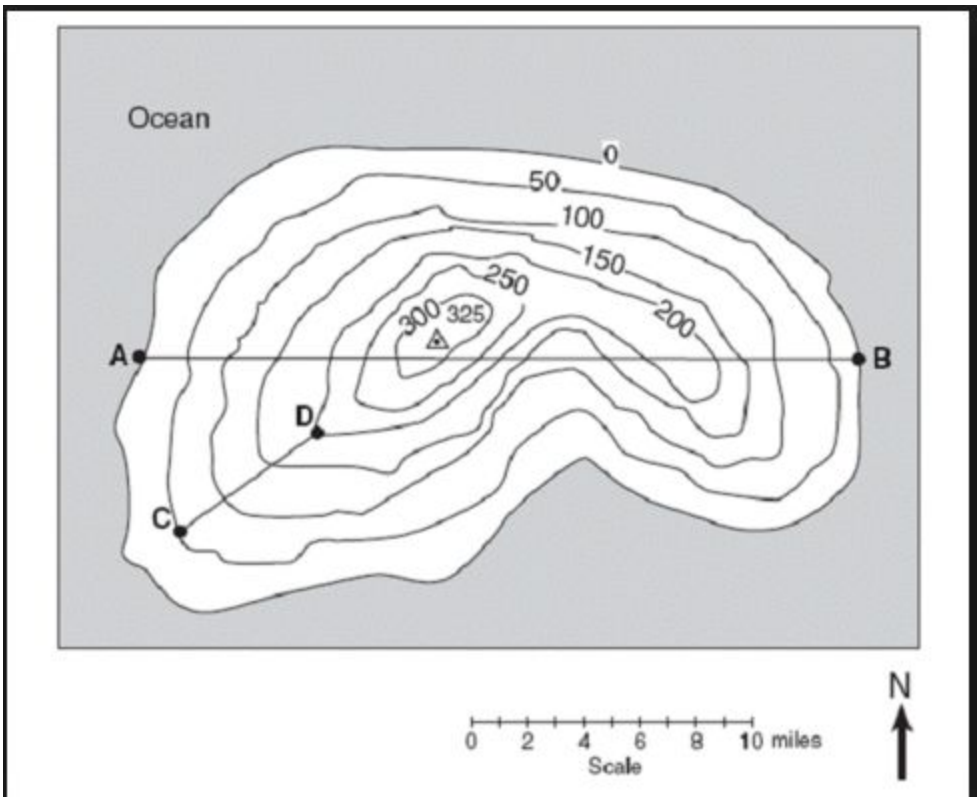
Deposition occurs when sediment that is eroded finally settles down. This most often occurs in areas of low elevation and/or slow moving water. The deposition of sediment can result in a number of different land forms such as:

- **Alluvial fans** - a fan shaped mass caused by deposition when a river's velocity decreases
- **Deltas** - a triangular tract of sediment deposited at the mouth of a river, typically where it diverges into several outlets.
- **Barrier Islands** - a long narrow island lying parallel and close to the mainland, protecting the mainland from erosion and storms.
- **Flood Plains** - an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.
- **Meanders** - one of a series of regular sinuous curves, bends, loops, turns, or windings in the channel of a river, stream, or other watercourse
- **Oxbow Lakes** - a curved lake formed at a former oxbow where the main stream of the river has cut across the narrow end and no longer flows around the loop of the bend.

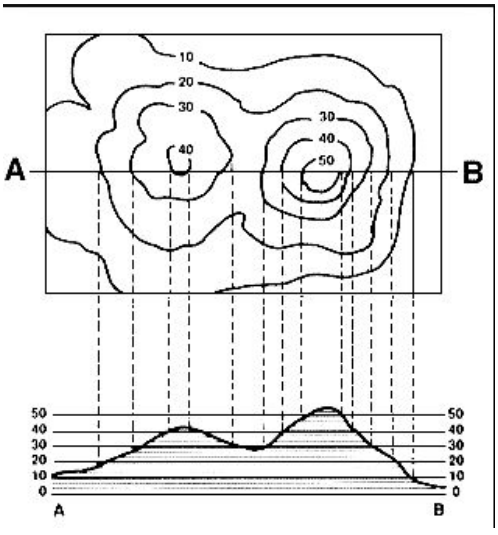
Pictures of the above formations are below (in the order of the bulleted list):

Topographical Map Review

Reread the "How to read a topographical map" section from last week's packet. Then, draw on notebook or printer paper a profile (side view) of the elevation between point A and point B in the following image. Use lines to mark the elevation like in the example.



Example:



Chemistry Review

Definitions:

- Chemical equation- a way of describing a chemical reaction using symbols rather than words
- Chemical change- a process in which one substance is transformed into another
- Chemical reaction- a process in which substances undergo a chemical change
- Chemical formula- a symbolic representation of an atom or molecule using letters to denote the type of atom or atoms in substance.

Notes:

- The chemical formula is made of one or two letters: O for oxygen, Cu for Copper, etc. The periodic table shows each element's chemical formula
- In a chemical formula, if a molecule has more than one atom of a particular element, it is denoted by a subscript (a number smaller and below the letter). CO_2 has one carbon atom (no subscript) and two oxygen atoms (subscript 2).
- In a chemical reaction, mass is balanced. That is, the number of atoms of each element in the reactants (left side of the equation) is equal to the number of atoms of each element in the products (right side of the equation)
- If, in order to balance the mass in a chemical reaction, more of a particular molecule is needed in the equation, then a coefficient is added. For example:
  $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ Read: "C H four plus O two reacts to form C O two plus two H two O".
    - In the reaction, there needed to be two oxygen molecules and two water molecules to balance the equation (as an optional exercise, check the balance for yourself by counting the number of atoms of each element on both sides of the equation).

Questions- Use the following chemical equation to answer the questions:

$N_2 + H_2 \rightarrow NH_3$

1. How many different elements are in this reaction? How many different substances?
2. How many atoms of nitrogen are on the reactants side (left side) of the equation? How many of hydrogen?
3. How many atoms of nitrogen are on the products side (right side) of the equation? How many of hydrogen?
4. Is the equation balanced? Explain your answer.
5. Use coefficients (numbers in front of the chemical formula) to balance the equation; remember, you cannot change subscripts to balance the equation.