

# Discovering The Past

*\* Created by Kyle N. Hoffman, Geology, Linn-Mar High School, Marion Iowa. 2009*

## Objectives:

- Students will be able to identify geological processes
- Students will be able to create a realistic scenario of unconformities formations

## Standards:

### Science as Inquiry:

1. Identifies questions and concepts that guide scientific investigations
2. Designs and conducts investigations
4. Formulates and revises scientific explanations and models using logic and evidence
5. Recognizes and analyzes alternative explanations and models
6. Communicates and defends a scientific argument

### Earth and Space:

3. Understands and applies knowledge of the origin and evolution of the earth system

## Essential Questions:

- What has to happen geologically for each type of unconformity to occur?
- What kind of observations do geologists have to make to identify past geological events?

## Teacher Notes:

This lesson is made for the students to create geologic events with an accompanied scenario for others to discover the ways to observe rock layers to identify past events.

You will need to create six or more different rock layers by making play-doh at home.

The ingredients are:

- 1 cup flour
- 1/2 cup salt
- 1 cup water
- 2 tablespoons oil
- 2 tablespoons cream of tartar

There are also several other recipes on the internet. Add different food coloring to each play-doh batch. Decide which color will represent which type of rock and label it.

## Engage:

Have three rock layer sections, either made or photographs for the internet. Ask them to illustrate the three sections and try to connect the sections. Have them explain what could have occurred between the sections (the parts that are not shown). Ask them what problems could occur with this observation method.

## Explore/Elaborate:

Have each of colored play-doh types and empty Tupperware containers set out on the counter. Pair the students up. Each pair will need to create a rock layer sample in the Tupperware container. If they choose to put fossils in their sedimentary layers, they need come up with what materials to use to represent the fossil. They will need to illustrate their layering

sample in their notebooks as they make it. They need to label each layer and any unconformity or cross-cutting that they include in their sample. After they are done with this, they will need to write out the entire process that occurred in their sample. This needs to be very detailed and realistic.

When they are done with this, they need to cover their container and swap it with another group. The new groups will do the following:

- Using straws the new group will take 3 rows of 10 core samples, numbering and layering each.
  - Try to find wider straws to use. Like ones used for shakes at fast food restaurants.
- Each row will need to be sketched – rock layers, unconformities, and fossils will need to be identified.
- Next the new groups need to describe step by step how they depict the rock layers, what happened for these layers to form.

When the groups are done, they will need to get together to discuss their answers. Since groups are swapping samples, it will make it easy for the groups to get together and be done in a timely manner. After their discussion, each group will need to write about why their answers varied from the original group's scenario.

After sharing the results with their small groups, ask for a few volunteer groups to share their columns with the class. On the white board, other groups will list what they interrupt from these columns. Have a class discussion about how different the interruptions are and how this is true in real world geology.

### **Extension:**

Have the students try to properly date their layers in comparison to the geologic times. Have them describe what occurred during those time periods and why they think their layers match the time periods they decided on.

### **Evaluation:**

#### Grading for this lab:

Original Sample:	5pts
Original Scenario:	5pts
New Data:	10pts
Analysis:	5pts
Total:	25 pts

Rubric is attached to student's handout.

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## Propose:

This is to give you a somewhat realistic experience of trying to date rock layers of an unknown section of the Earth. You will be taking core samples of an unknown Earth sample. All of your work will be done in your composition notebook.

## Materials:

- given batches of colored play-doh
- empty Tupperware containers

## Exploration:

### Step 1:

You and a partner will need to create a rock layer sample. You will use the colored play-doh set out on the counter. Each play-doh batch is labeled as a type of rock (different types of igneous, metamorphic and sedimentary rocks). You will need to thoughtfully put together a rock layer sample in one of the empty Tupperware containers. You will need to put the following into your sample:

- at least one of each type of unconformity
- at least two types of cross-cutting samples (faults, intrusions, extrusions)
- each type of rock (igneous, metamorphic and sedimentary) needs to be represented
- fossils (raisins) included in your sedimentary layers (optional)

You should illustrate your sample as you create it. Make sure to label each layer and event in your sample. It is suggested that you illustrate several different views of your sample (west and east views and a cross-section view).

Next, you and your partner need to write out a step by step scenario of your sample.

Make sure to include:

- a detailed description of how each layer formed
- what geologically occurred for the unconformities to form (be realistic)
- if fossils are a part of the sample, explain what type they might be and how they formed
  - o write down the number of fossils that you placed in your sample

Using duct tape or paper, cover your sample's walls so that only the top is open and visible. It is important to keep the top open so that groups may take their core samples with the straws.

### Step 2:

Swap your sample with another group. Make sure you take their sample and not another group's.

You will need to do the following:

- take 3 rows and 10 samples
  - o make sure that each row is a straight line across
  - o use the straws on my table to take a sample (you will need to figure out how)
  - o make sure to keep them in the same order you take them out
- for each row:
  - o illustrate each row, leave a space between each core sample
  - o When done, tape the core samples together for each row (KEEP IN ORDER!)

- try to fill in the empty spaces between each core sample you illustrated (be realistic)
- label each layer, unconformity and cross-cutting event that you have illustrated
- write out a detailed, step by step description of your sample from bottom up
- Include:
  - o a description of how each rock layer formed
  - o what geologically occurred for the unconformities and cross-cutting events to form
  - o if fossils are present, describe what type they might be and how they formed

### **Step 3:**

Get together with the group that you swapped with earlier. You will need to discuss with the other group what you came up with as your scenario. Once both groups have discussed what they did, compare your answers with what the original scenario was. You will need to write about:

- Why was your answer different then the actual scenario?
- Explain why you thought the way you did.
- Find out how many fossils were originally put into the sample.
  - o Find the percentage of fossils in your sample.
  - o Explain why geologists actually find so few fossils (especially large fossils) in the field. Remember to describe the fossilization process in your explanation.

### **Step 4:**

We will have a class discussion on what you learned about trying to identify rock layers by using this method. Think about and be ready to discuss what some positives and negatives are in this method.

### **Extension:**

Back in your group of 4, try to identify the age of each layer in terms of geologic time periods. Explain why you choose the time periods that you did. We will go to the computer lab after, to research your answers and see how accurate you are.

### **Evaluation:**

#### Grading for this lab:

Original Sample:	5pts
Original Scenario:	5pts
New Data:	10pts
Analysis:	5pts
Total:	25 pts

## Discovering the Past Rubric

	5	3	2	1
Original Sample:	Sample includes all requirements	Sample is missing 1-2 requirements	Sample is missing 3-4 requirements	Sample is missing more than 5 requirements
Original Scenario:	Scenario is thorough, realistic and matches the sample	Scenario is thorough, realistic but does not match the sample	Scenario is realistic but not thorough and does not match the sample	Scenario is not thorough, realistic and does not match the sample
New Data (x2):	Data collected includes all illustrations and other requirements	Data collected includes all illustrations but missing 1-2 of the other requirements	Data collected is missing 1-2 illustrations and missing 1-2 of the other requirements	Data collected has no illustrations and missing more than 3 of the other requirements
Analysis (x2):	Analysis is thorough, realistic and matches the sample	Analysis is thorough, realistic but does not match the sample	Analysis is realistic but not thorough and does not match the sample	Analysis is not thorough, realistic and does not match the sample

