SCIENTIST IN RESIDENCE PROGRAM™

Science Unit: **Fossils**

Lesson 6: **How Fossils Form 1 - Decay Lab**

School Year:	2015/2016
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Grade level:	Presented to grade 5-7; appropriate for grades 4-9 with age appropriate modifications
Duration of lesson:	45 minutes
Notes:	This is a two part lesson; students will need to observe and record the results of their fossil treatments a week later (see Lesson 7). Some of the decaying fruit will be smelly, so the samples are best stored in a utility room or closet, rather than the classroom!

Objectives

1. Gain insight into the process of fossilization by investigating how to best preserve a piece of fruit or vegetable for a week.
2. Practice setting up an experiment
3. Learn about the concept of a control
4. Practice observation and recording data skills

Background Information

The Earth is a great recycler. Most organisms are either eaten or decomposed by bacteria after they die. To become a fossil, then, it helps to be buried quickly, away from predators, in an environment that lacks oxygen (which many bacteria need). In this activity, students will investigate the best way to bury pieces of fruit or vegetable to preserve them.

Vocabulary

Bacteria:	One-celled, living microorganisms
Control:	In an experiment, a sample used for comparison, in which the variable being studied is held constant
Decay:	Rot or decompose through the action of bacteria or fungi
Decomposition:	The process of rot and decay
Fossil:	Evidence of a once-living organism preserved in rock.
Preservation:	The degree to which something is kept in its original state

Materials

- Small paper cups for samples, 4 per group, and sharpies or labels
- Variety of fruits and vegetables (not banana)
- Cutting board and knife
- Preservation agents: salt, clay, sand, dirt, glue, vinegar, lemon juice, ice box etc...
- Lab worksheet (Appendix)

In the Classroom

Introductory Discussion

1. You may want to administer an assessment probe on decomposition and decay, such as "Rotting Apple" or "Earth's Mass" (see Bibliography) to assess student understanding.
2. Review decay and decomposition

   3.Show an animal horn, bone, or empty shell. Where did the rest of the animal go?

   4.Burial as protection from predation and decay
   - To become a fossil, it helps to be buried quickly. Why?
   - Discuss some events which can bury organisms (volcanic eruption, flood, snowstorm, etc..)

5. Explain the activity to students.
   - Describe the experiment
   - You may want to ask students if they think it is a better idea if they all use the same preservation treatments, or if each group thinks of their own treatments
   - What makes a fair test?
   - What is a control?
   - Go over how to fill out data sheet (Appendix). Note the last two columns will be filled out during the next lesson, when results are checked.
6. Next week, students will observe how their fruit and veg pieces have changed. But how will they remember how their samples looked this week? Do they want to bring in fresh fruit and veg next week for comparison, or do they want to take photos of their samples this week?
7. Safety guidelines.
   - Students should bring fruit/veg to the teacher/adult helper for cutting
   - Students should not eat any of the fruit/veg samples during the lab
   - Wash hands after activity

Decay Lab Experiment

Experimental Treatments:

Control treatment	None; leave piece of fruit/vegetable uncovered in cup
Test treatments	For younger students, you may wish to prescribe the preservation agents for example, students can cover fruit/veg pieces with soil, sand, salt, lemon juice, ice etc.... For older students, you may wish to let them think up their own treatments given the materials available. Will they think to freeze samples?

Prediction or Hypothesis:
Which treatment will best preserve a piece of fruit or vegetable?

Methods and Instructions:

1. Before the lesson, tell students to bring in a piece of fruit or vegetable for the lab, except no bananas (we found them the most difficult to work with after a week because of the smell and mushiness!).

2. To set up the lab, set up cup station (cups, sharpies, and labels if needed); a cutting station (with a cutting board, knife and all the fruits and vegetables the students brought, which will be run by an adult) and a preservation station (with the different materials the students can use to cover their samples.)

3. Students organize into groups of 2 or 3
4. Each group goes to the cup stations, gets 4 cups, and labels them 1 (control), 2, 3, 4. Cup 1 will be the control, and will receive no treatment.
5. Then groups go to the cutting station, and choose a fruit or vegetable. Does the group want to keep the peel on? The adult will cut it into four equal pieces.
6. Put one piece in each cup. The group should return cup 1 to their desk, as the sample will not need to be covered. Groups may want to take a photo and/or weigh the control.
7. The groups take cups 2-4 to the preservation station. Either prescribe preservation treatments for each cup, or let the students choose. They should record the treatment used in each cup on their data sheet (Appendix)
8. Groups make predictions on which treatments will do the best job to preserve their samples, and record these on their worksheet.

Closure Discussion

1. What natural environments do the different preservation treatments mimic?
2. Why was it important to cut the fruit or veg into 4 equal pieces (the idea of a fair test)?
3. Making predictions. What preservation treatments will work best to keep the samples fresh?
4. Where do bacteria come from? Will bacteria be able to "find" the students' samples?

References

(examples of the format to use for different types of references are below)

1. <http://www.k5geosource.org/2activities/1invest/fossils/pg2.html> Why do some things become fossils, but others do not? American Geosciences Institute. [Fruit decay lab]. Accessed March, 2016.
2. Johnson, Elizabeth A., and Catley, Kefin M. 2002. Life in the Leaf Litter. American Museum of Natural History.http://www.amnh.org/our-research/center-for-biodiversity-conservation/publications/general-interest/biodiversity-guides/life-in-the-leaf-litter
3. Keeley, Page, Eberle, Francis, and Dorsey, Chad. 2008. "Rotting Apple." Uncovering Student Ideas in Science v. 3. NSTA Press. pp. 139-145.
4. Keeley, Page, Eberle, Francis, and Dorsey, Chad. 2008. "Earth's Mass." Uncovering Student Ideas in Science v. 3. NSTA Press. pp. 147-154.

Extension of Lesson Plan

Students can visit a local park and examine leaf litter to observe natural decay and decomposers. See "Life in the Leaf litter" in the Bibliography

Becoming a Fossil - Avoiding Decay

Lab Worksheet

The Earth is a great recycler! Most organisms are either eaten or decomposed by bacteria after they die. To become a fossil, then, it helps to be buried quickly, away from predators, in an environment that lacks oxygen (which many bacteria need). In this activity, you will investigate the best way to preserve pieces of fruit or vegetable.

Procedure:

1. Get 4 cups. Number them from 1 - 4. Write your team name on each up.
2. Get your teacher cut your fruit/veg into 4 similarly-sized pieces (each piece should fit easily in the bottom ½ of a cup). Decide whether you want to keep peels on or off.
3. Put one piece in cup #1. Do not do anything to this sample; it will be your CONTROL.
4. For cups 2-4, test out different treatments to preserve your fruit/veg pieces. Soil, sand, salt, clay, and vinegar are available, or you are welcome to use other materials you can find around school (but please check in with one of us first). Think about using treatments that mimic what might be found in nature.
5. Record the treatment you use for each cup in the "Preservation Treatment" column on the following chart:

Preservation Treatment	Predicted Condition	Condition After a Week	Notes/Observations
1. No treatment (control)			
2.			
3.			
4.			

6. Then predict how well your different methods will work to preserve your samples. Rank them from what your think will have best preservation (1) to worst (4) on the chart in the "Predicted Condition" column.
7. Leave the next two columns blank for now. You will fill these in next week. You will fill in the "Condition after a week" and Notes/Observations columns next week. After a week or so, examine your fruit/veg pieces, and rank them from best condition (1) to worst (4). How do the results compare to your predictions?