Lesson: D.I.Y. Plant Fossils

Grade Level: Third Grade, Life Sciences

Overview: Students will learn about the study of fossils, ***Paleontology***. Students will learn how analyzing fossils helps scientists understand what Earth was like thousands of years ago, including plant life. Students will then study about fossils using real plant trace fossils. The teacher will then guide students outside and they will have to choose a native plant and make a trace fossil using a guided recipe. Students will use a science journal to illustrate and write scientific descriptions of fossils based on the trace fossils created from their peers. The class will have to analyze the fossils to provide evidence of the local environment in which they live.

Science standards:
PA Academic Standards for Science and Technology

3-LS4-1: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

Science Practices:
APPENDIX F – Science and Engineering Practices in the NGSS www.nextgenscience.org

Practice 4 Analyzing and Interpreting Data

- Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations.
- Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.

Science Content:

Life Science- Biological Evolution: Unity and Diversity

Math Standards:
PA CORE STANDARDS Mathematics
CC.2.4.3.A.1: Solve problems involving measurement and estimation of temperature, liquid volume, mass, and length.

Math Practices:
PA CORE STANDARDS Mathematics- The Standards of Mathematical Practices
http://www.corestandards.org/Math/Practice/MP7/

- Model with mathematics. **CCSS.MATH.PRACTICE.MP4**
- Use appropriate tools strategically**. CCSS.MATH.PRACTICE.MP5**
- Look for and make use of structure. **CCSS.MATH.PRACTICE.MP7**

Math Content:
PA CORE STANDARDS Mathematics-

2.4 Measurement, Data, and Probability

A) Measurement and Data

Science & Math Connection:
Relationships and Convergences Found in the Common Core State Standards in Mathematics (practices), Common Core State Standards in ELA/Literacy*(student portraits), and A Framework for K-12 Science Education (science & engineering practices)*Venn Diagram NSTA Science, Math, & ELA.* https://static-nsta-org.webpkgcache.com/doc/-/s/static.nsta.org/ngss/PracticesVennDiagram.pdf

- **S2. Develop and use models**
- **M4.Model with mathematics**
- **S5. Use mathematics & computational thinking**

Materials:
- Ruler
- Pencil/Paper
- Fossil dough, (Recipe Below.)
- Wax paper
- Items to "fossilize" such as plant leaves, flower petals, tree bark
- Optional- Small rolling pins or plastic spoons.

Resources:
- Student Reading passage- *"Prehistoric Pollination"*
- D.I.Y. Plant Fossil Student Worksheet Guide
- "*The Street Beneath My Feet"* By: Charlotte Guillain https://www.amazon.com/Street-Beneath-My-Feet/dp/1682971368/ref=sr_1_1?crid=I2KBJ5ASAX8J&keywords=the+street+beneath+my+feet&qid=1666622492&qu=eyJxc2MiOiIxLjc5IiwicXNhIjoiMS40MCIsInFzcCI6IjEuMDkifQ%3D%3D&s=books&sprefix=the+street+benath+my+feet%2Cstripbooks%2C62&sr=1-1
- "Dig into Paleontology" video, https://youtu.be/1FjyKmpmQzc

Learning Objectives:
- Students will learn about different types of fossils and how they help scientists claim evidence about plant and animal relationships.
- Students will analyze and interpret data from fossils.
- Students will model by creating their own fossil cast.
- Students will demonstrate understanding of evidence by illustrating and writing scientific descriptions of fossils.

Procedure:
1. Have students read and answer student guided questions in the reading passage, *"Prehistoric Pollination"*.
2. The teacher will guide students into a class discussion and watch a video, 'Dig into Paleontology'.

3. Students will be put into small groups to observe and collect observations with plant fossils.
4. Students will then be guided into collecting specimens from the school's outdoor area.
5. When back in the classroom, the teacher will give students pre-made fossil dough or have students help make the dough.
6. Students will then follow the directions on the *D.I.Y. Plant Fossil Student Guide*.
7. Place fossils in a safe area to dry for 24 hours.

(Helpful tip: If the dough is thick, it may take longer to dry!)

8. When dry, have students exchange fossils with peers and investigate similarities/differences.
9. Have students complete questions on the *D.I.Y. Plant Fossil Student Guide.* (Use a ruler to measure fossil length/width).
10. Conclude lesson with STEM read aloud, "*The Street Beneath My Feet"* By: Charlotte Guillain.

Fossil Recipe:

The following recipe will make for a whole class, 20-25 fossils.

- 2 cups of flour
- 1 cup of salt
- 1 cup of cold decaf coffee
- 2 cups of wet decaf coffee grounds

OR

(For a non-coffee dough)

- 2 cups wheat flour
- 1 cup salt
- 1/2 cup warm water

Make a Plant Trace Fossil:

1. Mix all the ingredients using your hands. It should feel like dough when mixed completely.
2. Take a small amount of dough and shape it into a ball.
3. Place the ball of dough on wax paper then flatten it out with your hand or with a rolling pin.
4. Grab your plant specimen and press it into your dough. Press the entire specimen evenly. Use the back of a plastic spoon to help you press your specimen all the way down.
5. Carefully lift the plant specimen out of the dough.
6. Leave the dough alone to dry.

Examples of Plant Trace Fossils

Prehistoric Pollination

using fossils to solve a million years old mystery

Until time travel is invented, it is difficult to know what the world was like millions of years ago. Without evidence, scientists are left to make hypotheses, or educated guesses. Fossils are one type of evidence that may be used to learn about past life.

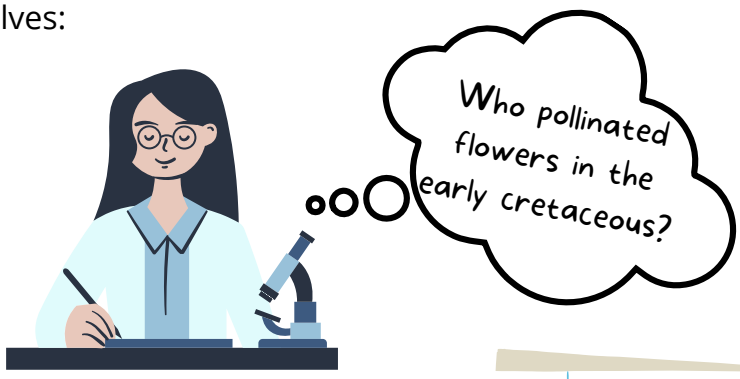
There are three main types of fossils. **Body fossils (1)** are the mineralized bodies of animals. **Mold fossils (2)** are the imprint of an animal's body which has since decomposed. **Trace fossils (3)** are left from an animal, such as footprints, nests and burrows.

1. Bryozoan by Kenneth C. Gass

2. Mold of a bivalve by Mark A. Wilson

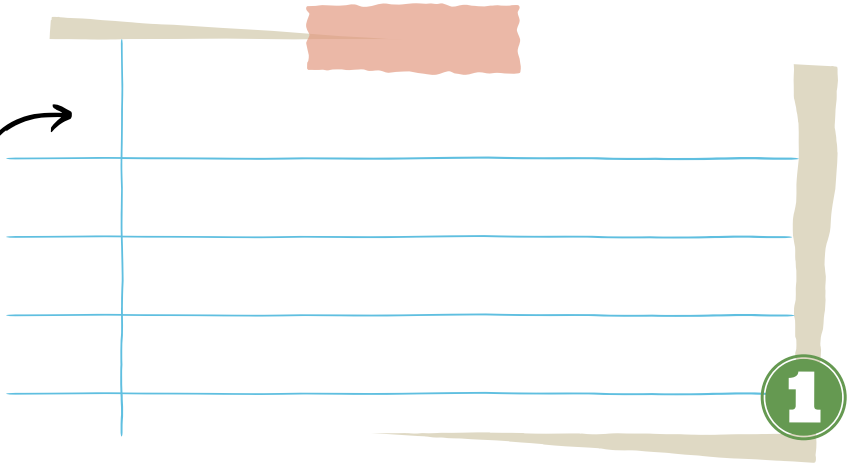
3. A dinosaur footprint by Mark A. Wilson

Prior to the cretaceous period, the landscape was filled with wind-pollinated **gymnosperms**, or plants with “naked seeds” such as pine trees with pine cones. Meaning, the wind acted as the pollinator for plant life. But then during the cretaceous period (145 MYA), **angiosperms** appeared; plants with flowers containing seeds. With this information, scientists asked themselves:



You might think Bees since they are the most important pollinator today. But Bees didn’t evolve until 80 million years ago. So it could not have been them!

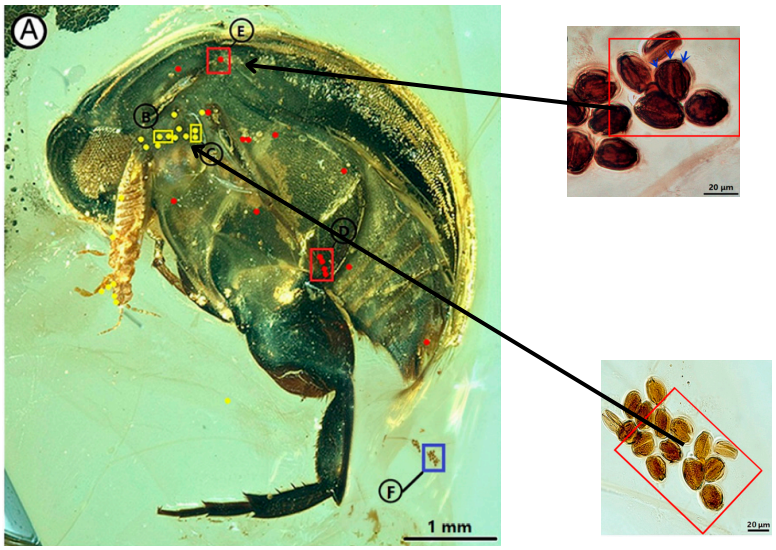
Ask: what features could scientists look for when examining fossils of potential pollinators?



Part of this mystery was solved when a unique **body fossil** was discovered! unfortunately, sometimes animals are trapped in tree resin. Resin fossilizes into amber and preserves the bodies of animals for millions of years.

A piece of amber containing a prehistoric beetle was found in an amber mine near Noije Bum Village, Danai Town in northern Myanmar. It dates back 99 million years ago. Scientists examined the specimen using microscopes and made discoveries too small to see with the naked eye.

The piece of amber contained grains of pollen. As seen in figure A, pollen grains attached to the body are colored red and unattached pollen grains are colored yellow.



This beetle was identified as *Angimordella burmitina*, a species of flower tumbling beetle. There are about 1,500 species of beetle in this family alive today, and they eat pollen. **This single specimen is the first fossil to provide evidence that insects pollinated flowers during the cretaceous period.**

Scientists also found body features similar to those of modern-day pollinators. The **mouth** is similar to those of pollen-eating insects. The **head** and **body** are positioned to increase flexibility, a characteristic that helps insects move in and out of flowers. The upper **hind legs** are enlarged, and the lower hind legs are spiny- these features aid in walking on uneven surfaces such as flowers. Finally, **long fine hairs** on the beetle's thorax and abdomen are spaced at a width ideal for catching pollen grains.

After fossils are studied, artists use scientific data to create an image depicting what the animal may have looked like when it was alive.

What do you think *Angimordella burmitina* looked like?

Draw *Angimordella burmitina!*

2

Think like a paleontologists!

Examine this "mystery species" fossil. **Predict** and answer the following questions using **evidence** you see in the resin fossil.

A **paleontologist** is a scientist who studies the history of life on Earth through types of fossils.

1.How do you think this animal was able to move?

2. What do you think this animal ate:

3. Was this animal a predator or a prey?

4. What species does this animal look like?

Now use the sketch box to draw what you think this animal looked like when it was alive!

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Name: _____

D.I.Y. Plant Fossils

Part 1

Draw Your Plant!

Make A Fossil

1. Mix all the ingredients using your hands. It should feel like dough when mixed completely.
2. Take a small amount of dough and shape it into a ball.
3. Place the ball of dough on wax paper then flatten it out with your hand or with a rolling pin.
4. Grab your plant and press it into the dough. You can use the back of a spoon to help you press down.
5. Carefully lift the plant specimen out of the dough.
6. Leave the dough alone to dry.

Part 2

Draw Your Fossil!

Write About It!

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Part 3

WHATS THE DIFFERENCE?!

A ***Trace Fossil*** is a fossil of a imprint of a foot, nests, and evidence of a living organism. A ***Bone fossil*** is the fossilized teeth, claws, and bones.

Direction: Your class has now made lots of plant trace fossils! Find a few classmates to switch fossils with. Draw their fossil in the empty boxes below. Then describe what evidence tells you more about their plant!