



## LESSON 3

### Find your fate

[insidethegreenhouse.org/shine](http://insidethegreenhouse.org/shine)



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This lesson strives to address NGSS, Colorado 2020 and JeffCo Generations standards and goals, cited at the bottom of the lesson, by communicating science through embodied expression

Shine, The Musical  
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Lizard and Trilobite capes drawn by professional artist (Credit: Steve Sutton DUOMO).

## Description

Explore the fates of plants and animals throughout time and consider the factors that result in the formation of soil, fossils, and fossil fuels.

## Concepts

1. Properties (or "props") and costumes can serve as communication aids in performance and dance
2. The environment that plants and animals live and die in impacts what happens to their bodies after death

## Outcomes

Upon Completion of this lesson, students will be able to:

1. Use props and costumes to communicate ideas and roles effectively
2. Describe three possible outcomes for the remains of plants and animals



Connections to the Fossils in the Classroom materials will be noted in the side bars of lessons 2-4

### Outline

- I. Set Up (20 min.)
- II. Introduction (10-15 min.)
  - a. Behavior Guidelines
  - b. Learner Level Assessment
- III. Find your fate (30-45 min.)
- IV. Follow-up Activities
  - a. Learn more about the FBI
  - b. The symbol of your fate
- V. Additional Resources
  - a. Sources
  - b. Vocabulary
- VI. Standards Addressed

### I. Set Up (20 min.)

#### Materials Needed

- A hat to pull fates from in the concluding activity
- A reusable water bottle for the intro activity

We'll also be using a set of fate cards that the teacher or an assistant will need to make beforehand. Enough "small cards" should be made so that every student gets one. One "large card" should be made for each fate. Cards will determine whether students become soil, fossils, or fossil fuels after they die.

**Small cards:** These are small tabs or paper and only need to be big enough to fit one word. Label  $\frac{1}{2}$   $\frac{2}{3}$  of the cards "soil,"  $\frac{1}{46}$  "fossil," and  $\frac{1}{46}$  "fossil fuels." So, for a class of 24 you would have 12 soil cards, 6 fossil cards, and six 6 fossil fuel cards. After cards are created, fold them in half and place them in the sorting hat for the concluding "Find Your Fate" activity.

**Large cards:** One large card will be given to each group (four total). They provide a description of the circumstances that created the group and should read as follows:



**The Fossils in the Classroom kits** are available for free and provide hands-on supplemental activities to help students consider geologic time

**Soil (two soil cards because it's the largest group):** Like most plants and animals of the ancient earth and today, when you died fungus, bacteria, and invertebrates (the FBI) ate your body and turned you back into soil so that new plants could grow. You became soil!

**Fossils:** You either got stuck in a mud pit in a coastal bog, slid down a giant sand dune and were buried, or were sucked into quicksand in a wetland depending on when and where you lived in ancient Colorado. This didn't allow fungus, bacteria, and invertebrates to eat your body, and your living cells were slowly inundated and replaced with minerals from the surrounding mud and rock as water trickled through over the eons. You became a fossil!

**Fossil fuels:** You fell into one of the ancient seas that bordered or covered Colorado and were swept into a thick layer of dead plankton, sank into a coastal peat bog and were covered by its vinegar-like juices and further layers of moss, or were trapped in one of one of the huge lakes of ancient northwestern Colorado and were covered with plant, fish, and animal debris over the years depending on when and where you lived in ancient Colorado. Over the eons you and the organic matter that surrounded you were encased in layers of rock and exposed to just the right amount of heat and pressure to become oil, coal, or oil shale. You became a fossil fuel!

## II. Introduction (10-15 min.)

Lessons 2-4 offer connections to the University of Colorado Natural History Museum Fossils in the Classroom kit. The kits are available for free to Colorado schools and provide hands-on supplemental activities to help students consider geologic time.

To get a University of Colorado Museum of Natural History Fossils in the Classroom kit, that includes 18 specimens, 5 lesson plans and support materials for your classroom or school, please contact Jim Hakala, Senior Educator, University of Colorado Museum of Natural History at 303-492-4458, or [james.hakala@colorado.edu](mailto:james.hakala@colorado.edu).

**Behavior Guidelines:** This lesson involves embodied learning. Please review the "**Guidelines for Embodied Lessons in the Classroom**" included in this curriculum.



Complete the Fossil Kit  
Laboratory Investigation  
1 worksheet

"How Fossils Form"

[www.colorado.edu/  
cumuseum/sites/default/  
files/attached-files/  
fossilkitlaboratory  
investigation1.pdf](http://www.colorado.edu/cumuseum/sites/default/files/attached-files/fossilkitlaboratoryinvestigation1.pdf)

and the  
Fossil Kit Laboratory  
Investigation 3  
worksheet

"Fossil Trackways"

[www.colorado.edu/  
cumuseum/sites/default/  
files/attached-files/  
fossilkitlaboratory  
investigation3.pdf](http://www.colorado.edu/cumuseum/sites/default/files/attached-files/fossilkitlaboratoryinvestigation3.pdf)

#### **Learner Level Assessment:** "Object in the Middle "

Arrange students so that they are standing in one large circle facing in. Place a common object in the center of a circle (a reusable empty water bottle works great). Walk into the circle, pick up the bottle pretending it is something else (ex. a baseball bat, a telescope, a kitten) and interact with the object in a way that allows the rest of the group to guess what the object is. Continue to interact with the object until someone guesses. Once someone guesses correctly, replace the object in the center of the circle and rejoin the circle. In turn, have each person walk into the center of the circle and interact with the object to convey something new that the object could represent. Continue this until each person has taken a turn. Encourage students to represent a unique thing if they can. If they choose to represent something that has already been done, they must do so in a new way.

**Assessment** (Outcome 1): *Each student uses the object in the middle as a communication tool and offers guesses on how others are communicating with the object.*

### III. Find your fate (30-45 min.)

Let students know that as each geologic era passed, the animals and plants died and were transformed. Based on the plants and animals each student created in lesson two, each student should come to the teacher and pull a "fate" card from the hat starting with the oldest plants and animals and moving to the youngest (small cards from lesson set up). Then they should go to a corner of the room or another area designated for their group. Students (representing their plants and animals) from earlier time periods who have already been transformed are encouraged to cheer on the others who share their fate as they join the group. Once everyone has found out their fate, **split the soil group into two equal soil groups for a total of four roughly equal groups**. Provide each group with the appropriate card that describes what became of them (large cards from lesson set up).

Students may wonder why there is more soil than other categories. This is because being turned into soil is by far the most common fate. Based on their group description, each group should decide on a set of three or four words that describes them. For instance, fossils might choose "strong," "old," "longevity," "steadfast." After choosing words to describe themselves, each group should choose a mascot (a plant or animal that is associated with their fate). For instance, fossils might choose the trilobite because it is a common and very interesting fossil. Oil might choose plankton, etc.



Identify "body" fossils and "trace" fossils included in the Fossils in the Classroom kit

Next, each group should create a human sculpture or a short skit to show what happened to their mascot and how it was affected by its fate. This allows for some drama and is open to interpretation. An example might be the FBI (Fungus, Bacteria, and Invertebrates) eating a T-Rex or a trilobite being slowly compacted into a fossil. Based on their experience with the "Object in the Middle" warm-up encourage students to find and use props creatively in their skits. While this is a fun activity, it's also important to **remind students of embodied learning etiquette**. Groups can choose whether to have all members participate in the sculpture/skit or have a narrator describe what's happening. Give each group roughly ten minutes of practice time and let them know that they will only have one to two minutes per group to present.

**Assessment** (Outcome 2): *Ask each group to perform their fate to the class. The audience is then invited to ask clarifying questions and provide feedback. If desired, this can be made into a competition with three or four awards such as "most dramatic," "most informative," or "best narration," depending on what best suits the class.*

If time allows, learn more about fossils by watching the University of Colorado Natural History Museum's Fossil Clues parts 1 and 2 found here: <https://www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom/materials-and-resources>

Triceratops fossil from Paleontology Hall at University of Colorado Natural History Museum.





### For More Fossil Resources

Explore the CU Museum of Natural History's virtual Paleontology Hall

<https://www.colorado.edu/cumuseum/3d-virtual-paleo-hall>

## IV. Follow-Up Activities

### a. Learn more about the FBI

As a class, learn The FBI Song by the Banana Slug String Band: <https://bananaslugs.bandcamp.com/track/fbi-fungus-bacteria-and-invertebrates>

**Assessment** (Outcomes 1 and 2): *Invent a set of actions to do for fungus, bacteria, and invertebrates as you sing the song as a class.*

### b. The symbol of your fate

Ask students to gather in their four fate groups and consider what the characteristics best describe their group. Start with the words they choose in the lesson and expand on the ideas. Ask students how these defining characteristics can be turned into a symbol, such as a flag or coat of arms, that represents them.

**Assessment** (Outcome 2): *Ask each group to design and create their symbol as a group. This will take coordinated team work, and each group member should agree with what's designed and contribute. After symbols have been designed, as each group to present them to the class and explain the choices they made for design and content.*

## V. Additional Resources

### a. Sources

National Geographic carboniferous description

<https://www.nationalgeographic.com/science/prehistoric-world/carboniferous>

Colorado Geological Survey Timeline

<http://coloradogeologicalsurvey.org/colorado-geology/timescale>

Denver Museum of Nature and Science Ancient Denvers Exhibit

<http://www.dmns.org/main/minisites/ancientDenvers/landscapes.html>

Tree of Life Project Synapsida information

<http://tolweb.org/Synapsida>

Sam Noble Museum, Gigantopterid fossil gallery

<https://samnoblemuseum.ou.edu/common-fossils-of-oklahoma/gallery/permian-fossil-gallery/permian-gigantopterids-gallery>



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Visit the Fossils in the Classroom web site

[www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom](http://www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom)

for additional resources especially the online section

[www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom/materials-and-resources/online-resources-teachers-and](http://www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom/materials-and-resources/online-resources-teachers-and)

University of Colorado, Boulder- Interactive Geology Exhibit  
<http://igp.colorado.edu>

University of Colorado, Boulder-Interactive Geology, A Brief History of Colorado Through Time  
<http://igp.colorado.edu/library/video/143654356>

Paleontology Portal  
<http://paleoportal.org/index.php#>

### b. Vocabulary

Property (prop): An object, often used to represent something it is not, for dramatic effect by an actor.

Costume: Any cloth, object, or addition to the body that extends or enhances its expressive ability, its ability to transform or be transformed.

Fate: A destined outcome that is beyond our control

Fossil: The actual remains or the impression left by an organism. Generally made of stone.

Soil: A mixture of organic matter, rock, and minerals found on the upper layer of the earth's crust. Soil is the crust layer in which plants grow.

Fossil Fuel: A carbon-rich substance such as coal, coal shale, or oil that can be burned to release the energy it contains.

Fungus: A large group of eukaryotic organisms that reproduce through spores and feed on organic matter.

Eukaryotic: Refers to cells that contain a defined nucleus.

Bacteria: Microscopic single-celled prokaryotic organism.

Prokaryotic: Refers to cells that do not have defined organelles.

Invertebrate: The largest category of animals on earth, making up over 90% of animal species. They don't have a backbone.





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**Plankton:** Free-floating marine organism that don't have the ability to resist the push and pull of waves and tide. Can be small (copepods, krill) or quite large (jellyfish, Ocean Sunfish).

**Eon:** A very long amount of time.

### VI. Standards Addressed

#### a. Next Generation Science Standards Addressed

4-LS1-1 From Molecules to Organisms: Structures and Processes

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-ESS1-1 Earth's Place in the Universe

Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

5-PS3-1 Energy

Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

#### b. JeffCo Generations Skills

**Self-Direction & Personal Responsibility:** Students take initiative, are inquisitive, entrepreneurial, and curious. They persevere through challenging situations, take calculated risks, and stand accountable for their actions. They continually advocate for their own needs as well as the needs of others.

**Communication:** Students learn to effectively communicate in written, digital, artistic, and oral forms. Students learn to explore and articulate their own points of view, while respectfully exploring and understanding the perspectives of others.

**Collaboration & Leading by Influence:** Students learn to work together, harnessing the power of teamwork, and learn the importance of influence to motivate others to get things accomplished.





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**Agility & Adaptability:** Students learn to change in response to dynamic situations, environments, and complex problems. Students adjust to disruptions, ambiguity, and uncertainty in themselves, their organizations, and their communities - and thrive in spite of the obstacles.

### Colorado Academic 2020 Standards Drama and Theatre Arts

#### *Create*

- Create characters from scripts or improvisation using voice, gestures and facial expressions
- Design a scene through an inventive process, and perform the scene

#### *Perform*

- Participate collaboratively with partners and groups
- Demonstrate safe use of voice and body to communicate characters

#### *Critically Respond*

- Develop selected criteria to critique what is seen, heard, and understood
- Examine character dynamics and relations

