Digging into the Past
Teacher Resource/
Post-Visit Activity

Howard B. Owens Science Center

Additional Activities/Resources for Digging into the Past

Post Visit Activity 1: Horseshoe Crab Puzzle
To help students review the parts of the horseshoe crab, have students put the horseshoe crab puzzle together. This can be a paired activity or each student can create his or her own horseshoe crab.

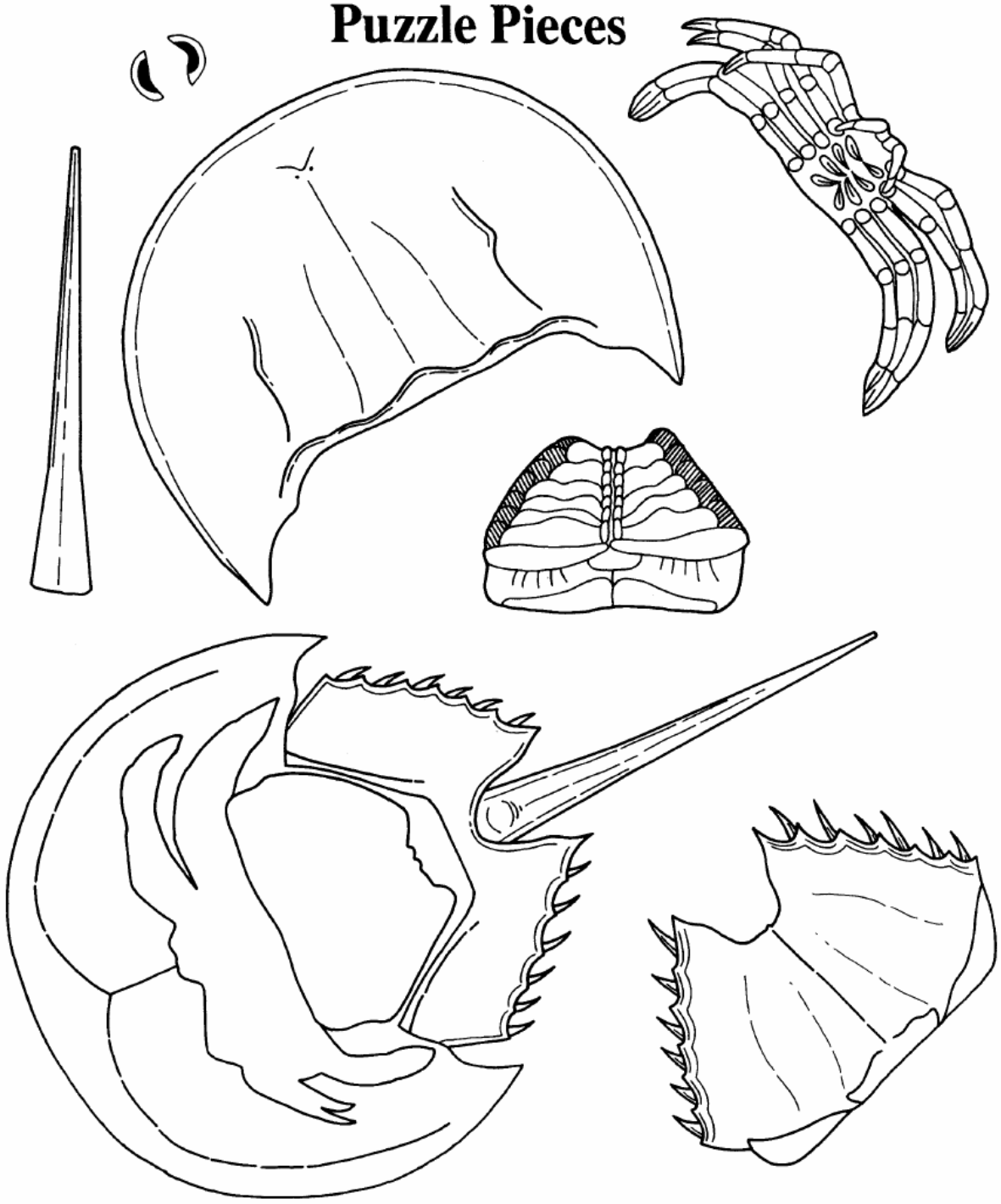
The teacher may choose to complete activity 1A, 1B or both activities.

Teacher Materials: 1 copy of Horseshoe Crab Puzzle pieces and answer key (The teacher may wish to copy the puzzle pieces on a light brown paper or allow students to color the final product to make it more realistic.)

Activity 1A: Students cut out the pieces and assemble them into a horseshoe crab. Some of the pieces will create the top of the horseshoe crab and some pieces will create the bottom of the horseshoe crab. Once the students have the top and bottom completely assembled they can glue the two halves together.
Student Materials: 1 copy of Horseshoe Crab Puzzle pieces per student or per pair
1 pair of scissors per student
1 glue stick per student or pair

Activity 1B: After students put the top half and the bottom half of the horseshoe crab together, they glue each half down to a larger sheet of paper. Then they label the major parts: cephalothorax, abdomen, tail (telson), legs, eyes, and book gills. The teacher may wish to write the words on the board in a word bank to help the students with labeling. Modification: Before starting, you can group the words into top words and bottom words. Students might choose to label the cephalothorax, abdomen and tail on both the top view and the bottom view.
Student Materials: 1 copy of Horseshoe Crab Puzzle pieces per student
1 pair of scissors per student
1 81/2 x 11 sheet of paper of construction paper
1 glue stick per student

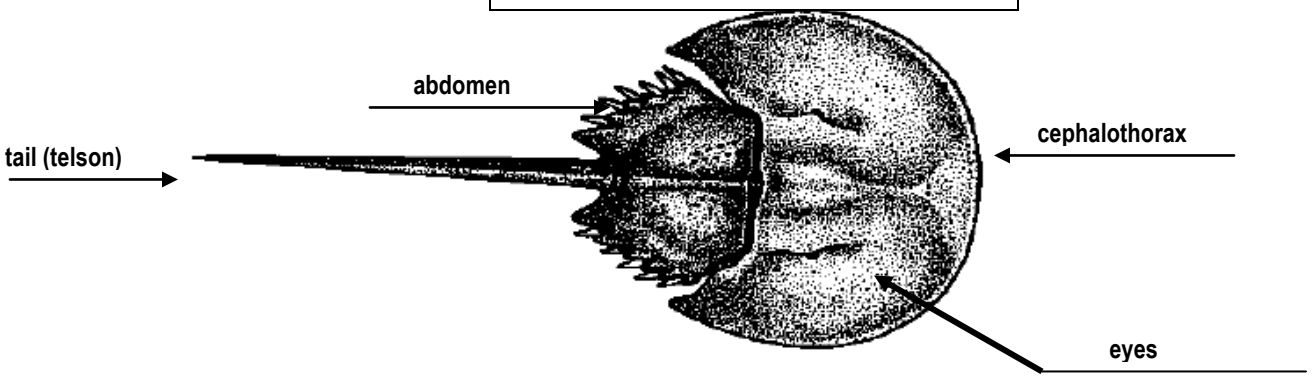
Puzzle Pieces



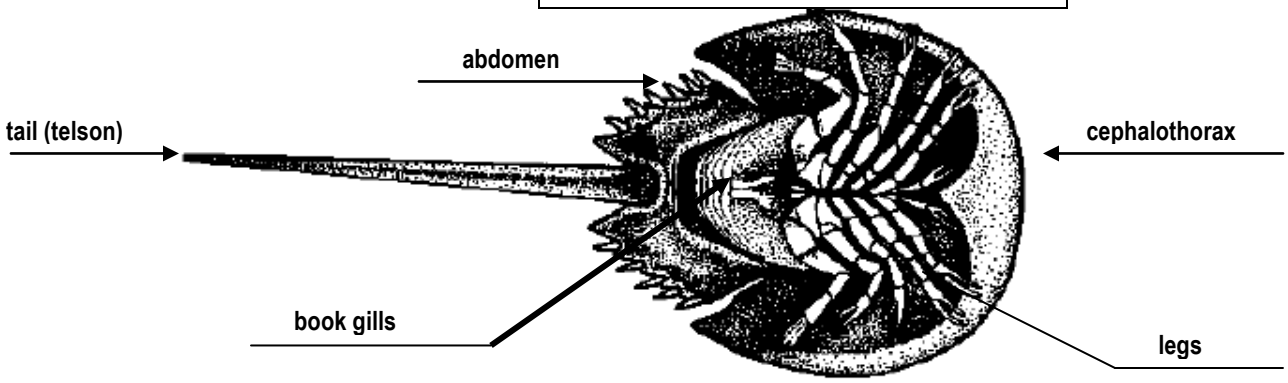
NATIONAL AQUARIUM IN BALTIMORE.

Answer Key

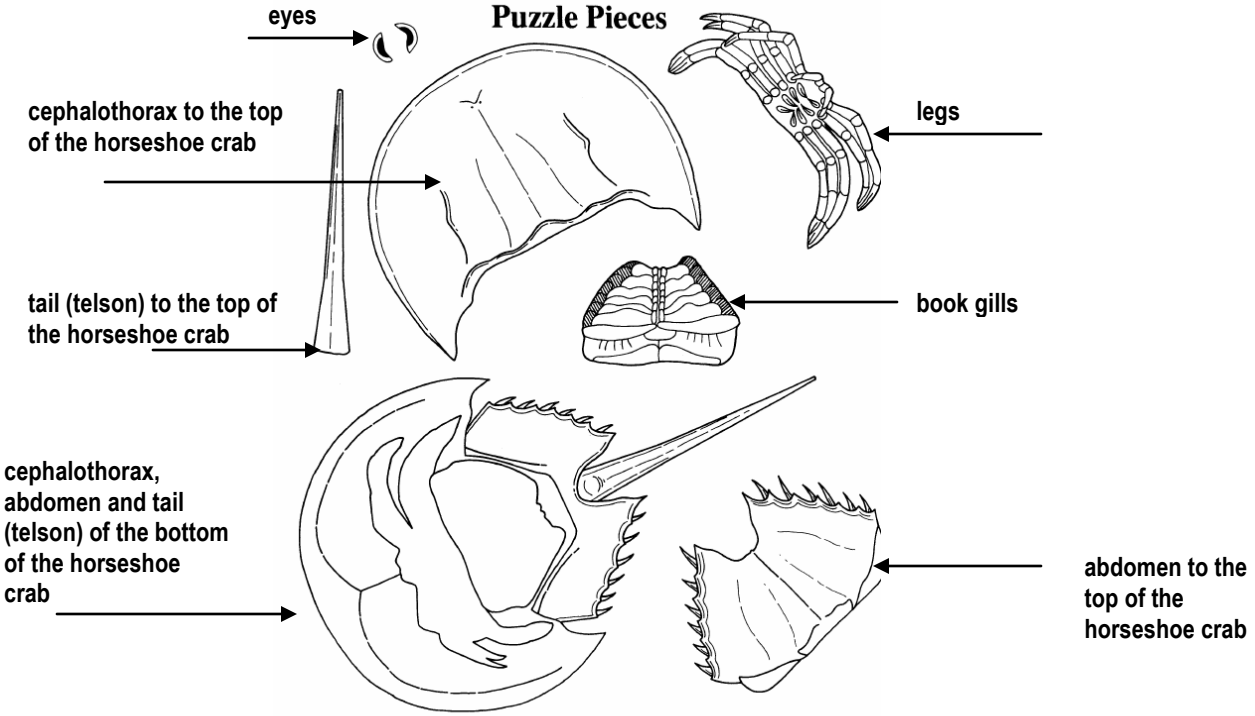
Top View of a Horseshoe Crab



Bottom View of a Horseshoe Crab



Puzzle Pieces



Post Visit Activity 2: State Symbol-The Maryland Dinosaur
Students read this short informative article "State Symbol-The Maryland Dinosaur" about the Maryland State Dinosaur, Astrodon johnstoni, and answer the questions provided. The teacher may choose to have the students answer the questions orally or in writing. The questions have been provided in a worksheet format; however, the teacher may also choose to write the questions on the board or overhead projector instead of copying the worksheet*. Students can complete the reading with help or as an independent activity.

Teacher Materials:

- 1 copy of the article "State Symbol-The Maryland Dinosaur"
- 1 copy of the questions and answer key includes the reading skill used in parentheses

Answer Key

1. **B** (recall)
2. **C** (sequencing)
3. **A** (inferring)
4. in the table below (recall/ infer)

___**d**_ flower	a. Astrodon
__**c**__ reptile	b. Baltimore Oriole
__**b**__ bird	c. Diamondback Terrapin
__**a**__ dinosaur	d. Black-eyed Susan

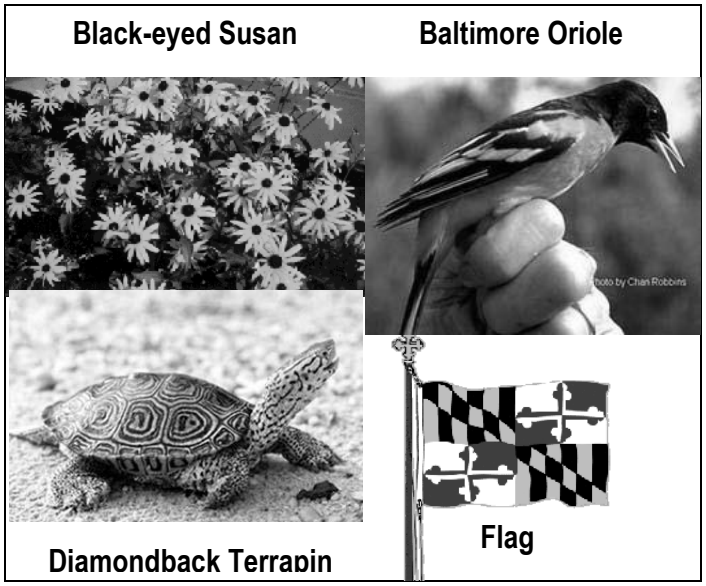
5. **Large, heavy (20 tons), round bodies, long necks and long tails (50-60 feet long), tall (30 feet)**. Student answers will vary. (retelling/ recall)

Student Materials:

- 1 copy of the article "State Symbol-The Maryland Dinosaur"
- 1 copy of the questions*

State Symbol-The Maryland Dinosaur

Maryland has many state symbols including a state flag, flower, bird and even a state reptile. But did you know that Maryland had its very own state dinosaur? In 1998, the *Astrodon johnstoni* was named the state dinosaur of Maryland. The *Astrodon* lived in Maryland from 95 to 130 million years ago.



In 1858 Philip Tyson discovered two teeth near Muirkirk in Prince George's County. It was one of the earliest dinosaur finds in this country. It was the first ever found in Maryland. Tyson gave the teeth to a local doctor and dentist Christopher Johnston. He sliced a tooth in half and discovered a star pattern.
Dr. Johnston named the new dinosaur *Astrodon,* which means "star-toothed*".*

These large dinosaurs weighed up to 20 tons. They had small heads, long necks, and long tails. Strong, solid legs supported their rounded bodies. *Astrodon* could be 50 to 60 feet long and more than 30 feet tall. They were herbivores, probably eating trees, ferns, and other plants.

Astrodon johnstoni. Illustration by Mark Crowell, 1998.

Name _____ **Date** _____

Answer the questions after reading "State Symbol-Maryland Dinosaur".

1. Astrodon is an **herbivore.** What would Astrodon eat?

   (a) meat
   (b) plants
   (c) plants and animals

2. Which event happened first?

   (a) Astrodon is named the Maryland state dinosaur
   (b) Phillip Tyson discovers fossil teeth of Astrodon
   (c) Astrodon dinosaurs lived in Maryland

3. The state dinosaur's name is Astrodon johnstoni. *Astrodon* comes from the word "star-toothed". Where did the second part of the dinosaur's name **johnstoni** come from?

   (a) The dentist's last name
   (b) where the dinosaur was found
   (c) what the dinosaur eats

4. Match the state symbols to their names.

_____flower	a. Astrodon
_____reptile	b. Baltimore Oriole
_____bird	c. Diamondback Terrapin
_____dinosaur	d. Black-eyed Susan

5. Describe the dinosaur Astrodon _____

_____

Additional Activities/Resources for Digging into the Past

Post Visit Activity Model Fossils

Activity 3A: Making your own amber model fossils

The model amber fossils used in class were created with a hot glue gun and glue sticks. This can be dangerous for students as the glue gun can get very hot in order to melt the glue. However, you can create a similar model with regular school glue. This is a great opportunity to talk to students about the use of models (representations of the real thing) their uses and limitations (for example: not exact, sometimes larger or smaller that real thing, make not show all the parts or details, is a representation of the real thing).

Teacher Materials:

Directions, space for the models to dry

Student Materials:

1 sharpie marker (this can be shared) for writing name
1 paper cup/student
1 object to become the fossil (plastic bugs work great)/student
1 small bottle of school glue that dries clear/student

Directions:

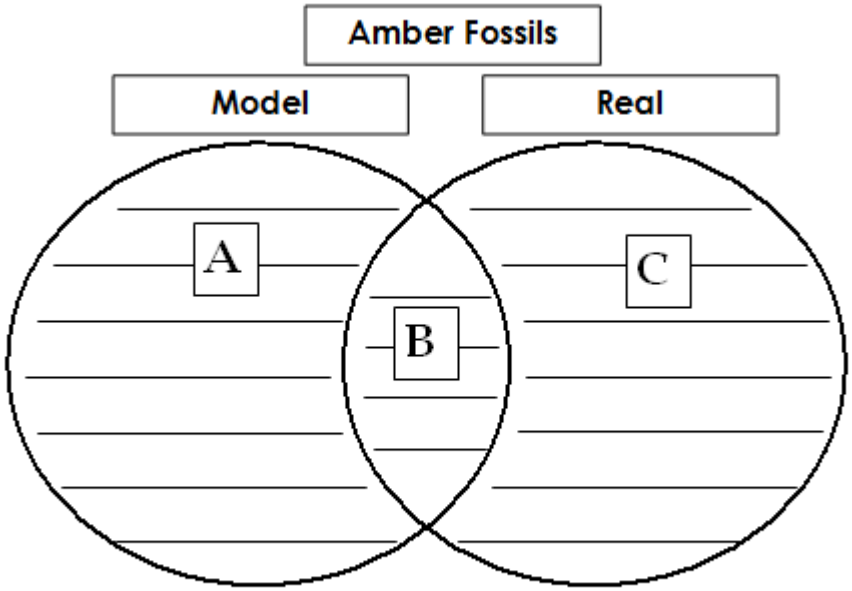
Step 1: Find an object to trap in amber (spider rings* have been provided to your class. Cut off the back of the ring so the spider will lay flat in the glue).
Step 2: Write the name of the student on the paper cup with a marker (narrow bottoms work the best, since they use less glue, but they need to be big enough for the object to fit).
Step 3: Place one object in the bottom of a paper cup.
Step 4: Trap object in faux amber by squeezing glue over the object until it is completely covered.
Step 5: Set aside and let dry for 2-3 days.
Step 6: Tear away the paper cup. You now have a disc shaped model of a fossil trapped in faux amber.

*The spider rings are glow in the dark. If you place the fossils in the light for several hours you should have a glow in the dark fossil stuck in faux amber.

Activity 3B: Comparing Fossils
Have students compare the model amber fossil to a real amber fossil. How are they alike and different? You can use a Venn diagram to start the thinking process (this is part of the PGCPS Literacy Toolkit) and then have the students write a paragraph about how the two fossils are alike and a paragraph on how the two fossils are different.

Teacher Materials:
Pictures of real amber fossils (this can be projected on overhead, placed in a PPT slide or on a doc cam)
Copy of Venn diagram (this could be on overhead, digital or chart paper)

Student Materials:
Copy of Venn diagram
Model Fossil
Access to pictures of real fossils



Possible Answers:
A: Glue, All spiders, all same size, all same shape, glow in the dark (unless using the ones done a HBOSC), plastic bugs, 2-3 days to form, all same age

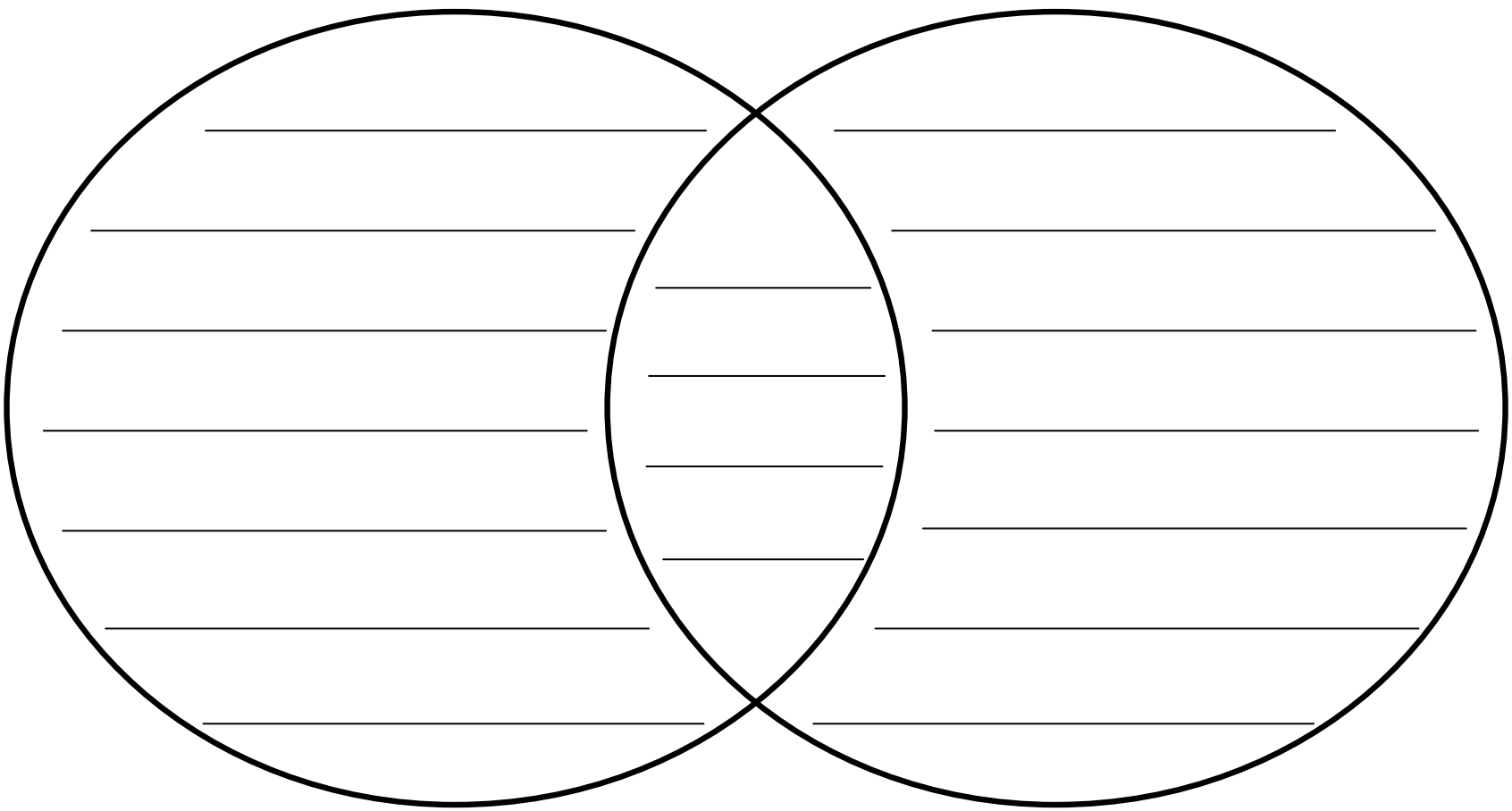
B: contain organisms, trapped in a sticky substance, preserve the object/organism

C: different ages, different organisms/objects, different sizes, different shapes, made from tree sap, take 10,000 years or longer to form

Real Amber Fossils

Model Amber Fossils

Amber Fossils



Note to teachers on horseshoe crabs:
Many of the students will not have had any experiences with horseshoe crabs prior to this program. This "living fossil" is fascinating and can be found in our own Chesapeake Bay and Delaware Bay. Along with the horseshoe crab puzzle activity; there are several other resources the teacher may wish to use to enrich the students' knowledge.

WEBSITES

1. ERDG Website: The Horseshoe Crab
http://www.horseshoecrab.org/index.html (accessed 2 March 2017)
This is a great site for background information for the teacher of the anatomy, evolution, habitat, natural history, and medical uses of the horseshoe crab in quick readable summaries with supporting images. This site also sponsors a poetry and poster contest that students can enter. Teachers can also get free brochures from this site. There is information for teachers to participate in a professional development opportunity in Delaware called "Green Eggs and Sand" Workshop for teachers who may be interested in raising horseshoe crabs in the classroom.

2. Maryland DNR website: Horseshoe crabs "A Living Fossil"
http://dnr.maryland.gov/fisheries/Pages/horseshoe-crab.aspx (accessed 1 Feb 2018)
This is another great site for background information for the teacher. There is information here also for professional development if the teacher wishes to raise horseshoe crabs in the classroom. This is a Maryland workshop and it also gives information on mini-grants from ARE and Chesapeake Bay Foundation that would help with the cost. http://dnr.maryland.gov/ccs/Pages/ges.aspx

3. American Geologic Institute- " What can fossil footprints tell us"
https://www.americangeosciences.org/education/k5geosource/activities/investigations/fossils/what-can-fossil-footprints-tell-us. The last one "What can fossil footprints tell us?" allows students to analyze dinosaur footprints and ask questions. There are a series of probing questions and a great opportunity for students to practice the argumentation skills- Claim (C) Evidence (E) and Reasoning (R) as there is more than one possible answer.

4. **Dinosaur Fund Program** http://www.glue.umd.edu/~gdouglas/dfund/index.html (accessed 1 Feb 2018)
Learn about the local efforts of Dr. Peter Krantz and others to fund a dinosaur park here in Maryland and maybe raise money to donate to the fund.

5. **Google Earth-** https://earth.google.com/download-earth.html (accessed 1 Feb 2018)
The Google Earth app was used to create the video clip to show where the "phenomenal rock was found". This is one of the many great features of Google Earth. You can download it for free and you do not need administrative rights (for PC users) to add it to your computer. This is a great resource for your students to explore.

6. **Scribble Maps**- www.scribblemaps.com –This site was used to create the fossil locations on the iPad. There is a free version and a paid version. Teachers and students can create their own maps and save them on the free version. They can also share them via email or with a code for importing to another device. You can download the app or just access it via the internet. (accessed 1 Feb 2018)

VIDEOS

Video clips from Discovery Education. Once you login through Clever to the Science Techbook, you can search for the video clips by name. The videos are divided into video clips or segments. So it is not necessary to always show the entire video. You need only show the segments of the video that best fit the instructional needs of the class. Following the name of each segment is a set of parentheses with numbers in them. The numbers represent the length of the segment in minutes and seconds. If you are a PGCPS teacher you will access Science Techbook through CLEVER. It is always best for the teacher to preview the video before showing it to the students. Also, it is a good idea to download the video clip to the computer desk or save it to a disk. This will avoid any Internet streaming problems on the day the video clip is used. It will also guarantee access forever to the video.

1.. Video Segment "Amber" (4:35) Plants and animals trapped in amber, the fossilized resin from trees, provide a record of Earth's past.- Show the first 2 minutes of the video- Even though it is listed for 6-6 grade students it is a great visual of how organisms are trapped in tree sap and become fossilized. It also shows scientists digging the amber out.

2. Video clip "Prehistoric Survivors: The Horseshoe Crab (11:17) from the video Discover Magazine: Living Fossils. Most of this would be background information for the teacher. However, the teacher could show the first 2:20 of the video to the students, which is an overview of the horseshoe crab.

3. Video "Fossil Life: An Introduction (20:39). This video discusses what a fossil is and by using fossils we can tell how some animals have changed, some look very similar to the animals of today and some are extinct. The video examines these animals through three different ecosystems, ocean, seashore and land. There is also a video quiz at the end. There are eight segments and so the viewing can be broken down into separate sessions:
"What are fossils?" (2:20), "Three Major Ecosystems" (0:23),"The Ocean" (5:18), "The Seashore" (2:39), "The Land" (4:15), "Dinosaurs" (1:24), and the "Video Quiz" (1:19)

4. Video clip "Dinosaurs and Fossils" (5:37) from the video TLC Elementary School: Prehistoric Earth. This segment of the video is very appropriate for students. It reviews the terms fossil and paleontologist. It discusses some of the tools that paleontologists use to dig for fossils and the clues that fossils give us of the past.

5. Video Where Did They Go?: A Dinosaur Update.(22:00) This video contains 11 segments. Although the grade level lists it at 3-5, the material is presented in a very easy to understand way. The entire video is well done. If time is a constraint some of the key segments included
"Welcome to the (Extinct) World of Dinosaurs" (1:46) - great just as introduction
"Dinosaurs are Extinct" (2:28) – makes an important point about dinosaurs being extinct and humans NOT being around at the time of dinosaurs
"Different Types of Dinosaurs and Non Dinosaurs" (1:42)
"A Variety of Dinosaurs" (2:16)
"Why the Dinosaurs Became Extinct" (1:35) presents two important theories (comet impact and slow climate change)

OTHER FIELD EXPERIENCES

1. Maryland Science Center in Baltimore, MD https://www.mdsci.org/
The Maryland Science Center has an outstanding fossil and dinosaur exhibit on the first floor including a full size model of the Maryland dinosaur, Astrodon. The Maryland Science Center is always free to Prince George's County teachers. All the teacher needs to do is provide proof of employment at the door when getting a ticket (school id, pay stub). Visiting Prince George's County Public Schools are free during certain months of the year as long as at least one teacher has participated in their training. Teachers should plan their trips early and get their reservations in because the spots fill up fast.

2. Smithsonian Natural History Museum http://www.mnh.si.edu/visit/
The Natural History Museum, also a free admission, is currently undergoing a big renovation in for its fossil displays. https://naturalhistory.si.edu/visit/galleriesexhibits.html The website has some great teacher resources to gather background information on fossil formation and paleontology.
http://paleobiology.si.edu/

3. **Calvert Marine Museum** http://www.calvertmarinemuseum.com/183/Paleontology-Gallery for those schools in the southern part of the county, a trip to the Calvert Marine Museum can be great experience. They have many fossils on display. There is a small fee for this and group rates are available (check website for most recent prices). This is a smaller facility, so plan accordingly.

Note: If a link does not work by clicking on it, paste it into the browser. Some sites are set up to respond better to different browsers, such as Chrome, Foxfire or Internet Explorer.