

Fossils

Lesson Plan for Grades: 9-12

Length of Lesson: 2 hours 15 minutes

Authored by: UT Environmental Science Institute

Date created: 08/01/16

Subject area/course:

- Biology, Earth and Space

Materials:

- Fossil sample envelopes & instructions
- Fossil excavation worksheets
- Fossil excavation reports
- Posters
- Pens/Markers
- Computers and access to internet

TEKS/SEs:

§112.36 Biology

- (2) Scientific processes. The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:
- (E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology
 - (G) analyze, evaluate, make inferences, and predict trends from data; and
 - (H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports
- (7) Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life. The student is expected to:
- (A) analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental

§112.36 Earth and Space Science

- (2) Scientific processes. The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:
- (G) organize, analyze, evaluate, make inferences, and predict trends from data
 - (I) communicate valid conclusions supported by data using several formats such as technical reports, lab reports, labeled drawings, graphic organizers, journals, presentations, and technical posters
- (8) Earth in space and time. The student knows that fossils provide evidence for geological and biological evolution. Students are expected to:
- (A) analyze and evaluate a variety of fossil types such as transitional fossils, proposed transitional fossils, fossil lineages, and significant fossil deposits with regard to their appearance, completeness, and alignment with scientific explanations in light of this fossil data

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Lesson objective(s):

- Students will analyze, organize and evaluate fossils provided and communicate their results in an organized manner.

Differentiation strategies to meet diverse learner needs:

- ELL students and students with learning disabilities should have multiple forms of instruction including visual and written instruction sheets as well as a verbal instruction and demonstration.

ENGAGEMENT (15 minutes)

- Class divides into groups of 3-4. Teams have 10 minutes to answer the following questions:
 - What is a fossil?
 - Why are fossils important in science and history?
 - What are some of the things fossils can tell us?
- As a class, teacher leads discussion on the answers from each team.
- Teacher introduces the goal of the lesson: Working in teams of 3-4, students will become paleontologists. Over a period of three “excavation” days, teams record their results after each “excavation” and make assumptions about the type of animal discovered.

EXPLORATION (45 minutes)

- Teacher distributes one of the fossil sample envelopes to teams of 3-4 students. Teams will work as paleontologists finding “fossils” over a period of three “excavation” days. Teams record their results after each “excavation” and make assumptions about the type of animal discovered.
- Teams then collaborate with another paleontologist team. Teams spend 5 minutes comparing the bones and record any new assumptions based on shared information.
- Each team creates and presents a 5-minute report which includes the following:
 - What was your initial assumption after the first day of “excavation”?
 - Did the discovery of new bones cause disagreements among the group regarding your initial conclusions?
 - How did the information from the other paleontologist team affect your team’s results?
 - What additional information does your group still need to finish identifying the fossils?
 - Teacher walks around the room asking questions about what students are doing
 - Teacher listens to student ideas as they talk to each other
 - Teacher provides support to students as needed (without providing the answer)

EXPLANATION (30 minutes)

- Teams present a 5-minute report which includes the following:
 - What was your initial assumption after the first day of “excavation”?
 - Did the discovery of new bones cause disagreements among the group regarding your initial conclusions?
 - How did the information from the other paleontologist team affect your team’s results?
 - What additional information does your group still need to finish identifying the fossils?
 - Teachers encourage students to explain concepts in their own words.
 - Teachers highlight important ideas that students provide.
 - Teachers introduce vocabulary, formal labels or definitions as needed.

ELABORATION (45 min)

Fossils

- Teams use the *Skeletal Resource Manual* to look at drawings of existing animals. Based on the similarities of skeletons found in the resource, teams make a final conclusion about their fossil find. Teams add to their poster the following information:
 - Type of animal you think your fossil was.
 - A drawing of what the animal might have looked like.
 - Where you think the animal may have lived (in water, land or air) and evidence supporting your conclusion.
 - What you initially thought was the animal on the first day of “excavation”.
 - Evidence that made you change your interpretation.
- Posters will be displayed in a gallery walk. Teams must evaluate 3 other posters using the rubric provided.
 - Teachers ask students to use the new vocabulary appropriately.
 - Teachers encourage students to incorporate real world connections.

EVALUATION (throughout)

- Students will be evaluated on their posters and evaluations of team posters during the gallery walk.
 - Teachers ask questions that provide insight into student progress.
 - Teachers observe students as they create products and look for evidence of understanding.

SOURCES AND RESOURCES

- *Hot Science – Cool Talks #66 “Remarkable Creatures”* by Dr. Sean Carroll, www.hotsciencecooltalks.org
- Evolution & the Nature of Science Institute, “The Great Fossil Find”, <http://www.indiana.edu/~ensiweb/lessons/gr.fs.fd.html>

Fossils

TEACHER HANDOUT: EXPLORATION ACTIVITY (45 minutes)

Purpose: Teams will work as paleontologists finding “fossils” over a period of three “excavation” days. Teams record their results after each “excavation” and make assumptions about the type of animal discovered.

Materials:

- Fossil sample envelopes & instructions
- Fossil excavation worksheets
- Fossil excavation reports

Safety Information: N/A

Procedure:

Prior to Class:

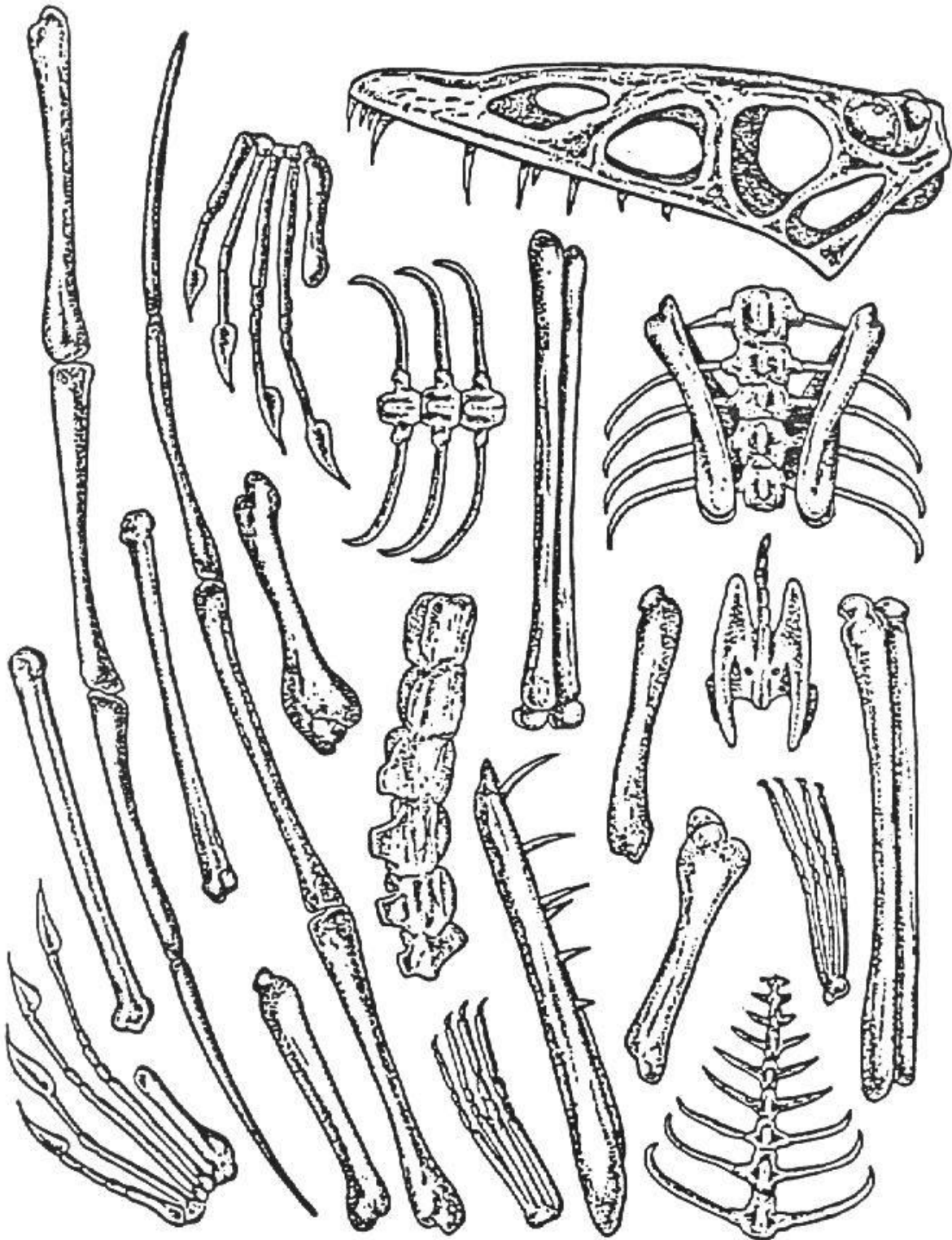
- Make copies of the fossil template and cut out the different fossil pieces.
- Create an envelope with the fossil pieces for each team. Consider the following variations:
 - Not all teams get all fossils. This way when teams collaborate with other paleontologists they can get a better idea of their fossil when they share information.
 - Consider using two different types of fossils and color code the envelopes. When teams share with another paleontologist team, they should share with teams with their same color.

During Class:

- Pass out sample envelopes & instructions, excavation worksheets and reports to teams of 3-4 students. Teams will work as paleontologists finding “fossils” over a period of three “excavation” days.
- Teams record their results after each “excavation” and make assumptions about the type of animal discovered.
- Teams then collaborate with another paleontologist team. Teams spend 5 minutes comparing the bones and record any new inferences/assumptions based on shared information.
- Each team creates and presents a 5-minute report which includes the following:
 - What was your initial assumption after the first day of “excavation”?
 - Did the discovery of new bones cause disagreements among the group regarding your initial conclusions?
 - How did the information from the other paleontologist team affect your team’s results?
 - What additional information does your group still need to finish identifying the fossils?

Fossils

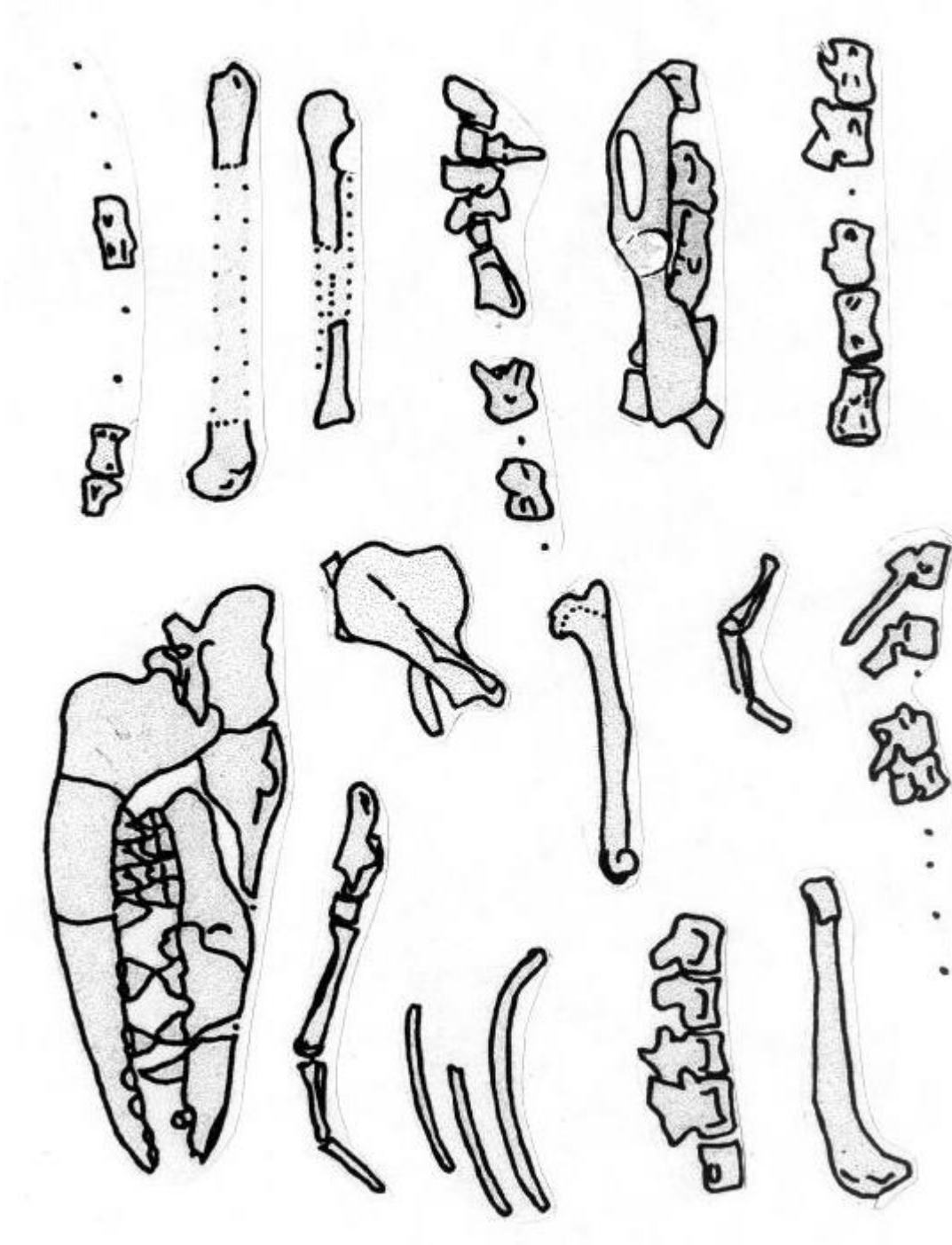
TEACHER HANDOUT: Fossil Template 1





Fossils

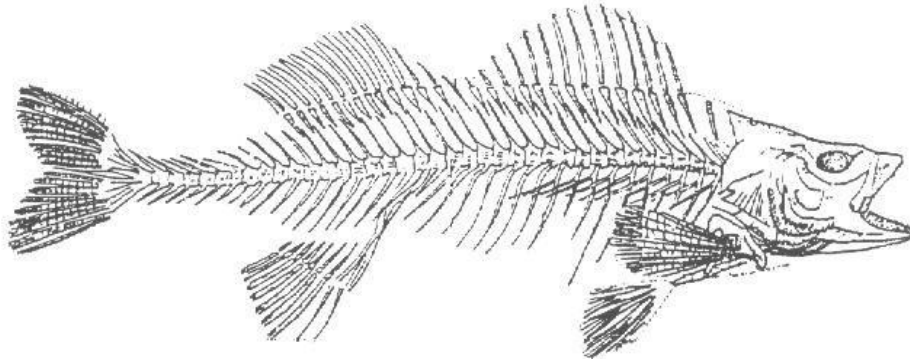
TEACHER HANDOUT: Fossil Template 2



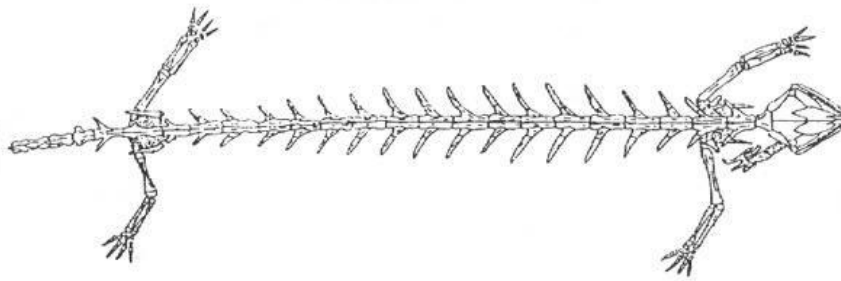
Source: Evolution & the Nature of Science Institute, "The Great Fossil Find", <http://www.indiana.edu/~ensiweb/lessons/gr.fs.fd.html>

Fossils

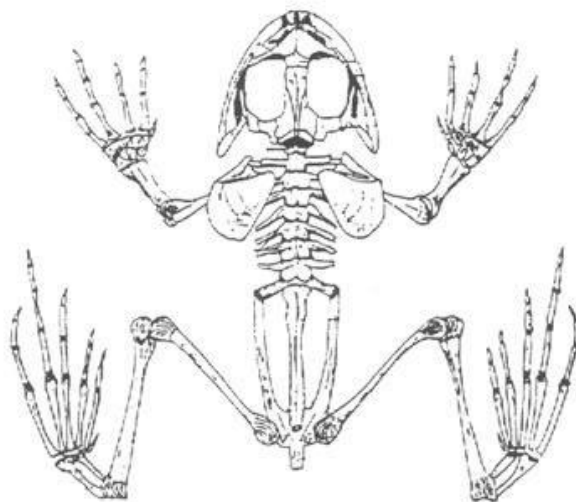
TEACHER HANDOUT: Skeletal Resource Manual



FISH (Perch)

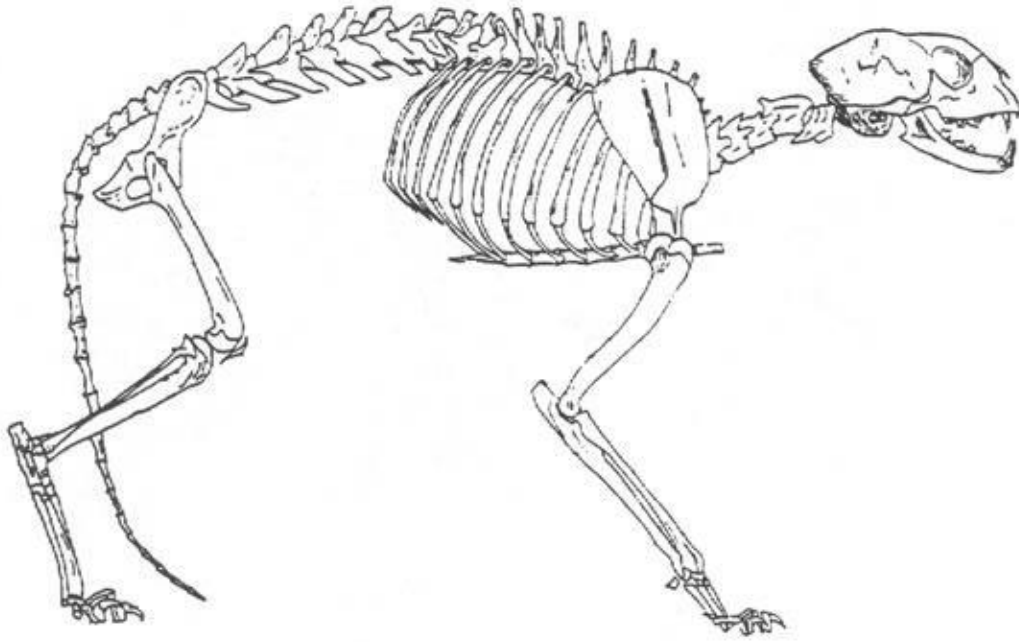


SALAMANDER (Necturus)

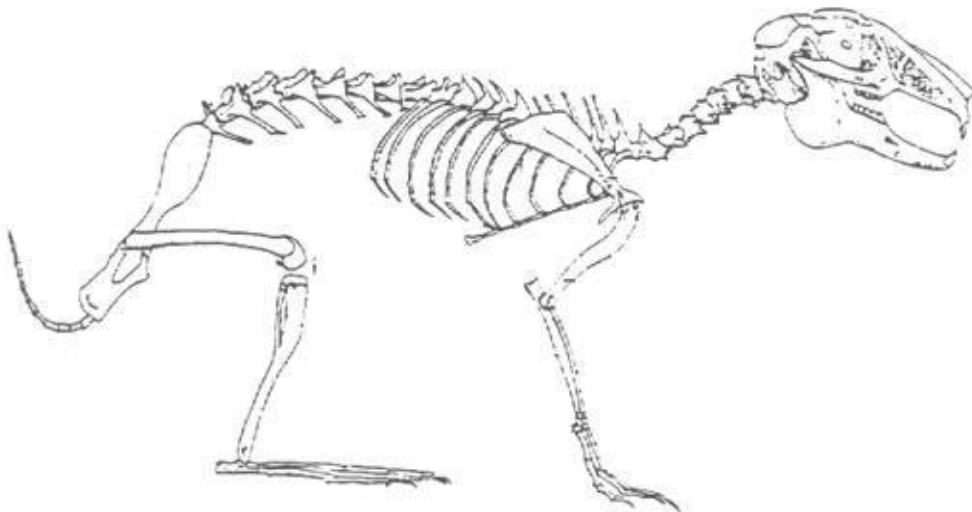


FROG

Fossils

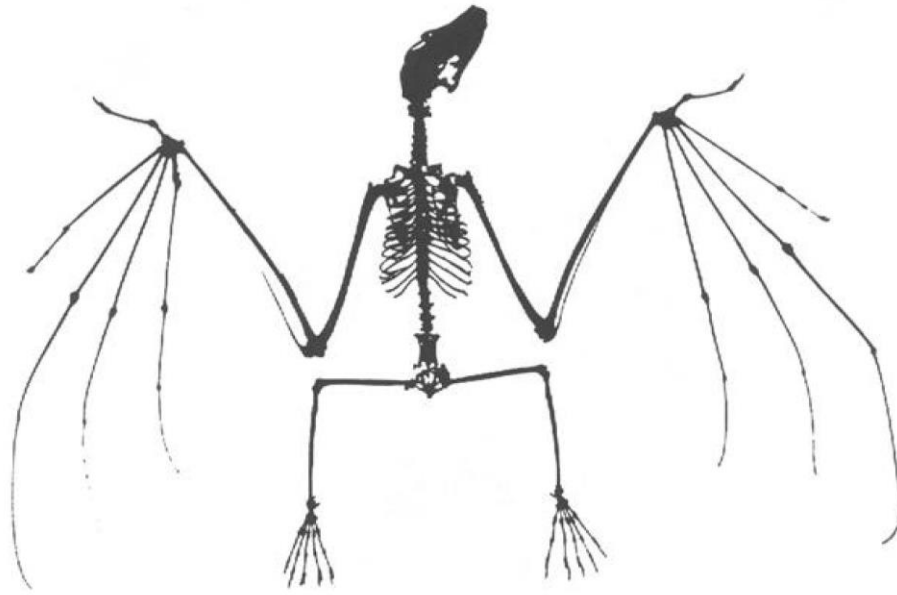


CAT

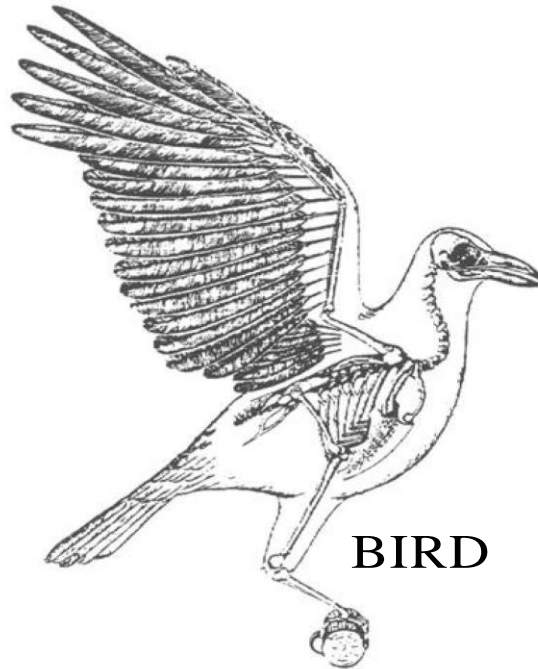


RABBIT

Fossils



BAT



BIRD

Source: Evolution & the Nature of Science Institute, "The Great Fossil Find", <http://www.indiana.edu/~ensweb/lessons/gr.fs.fd.html>

Fossils

STUDENT HANDOUT: EXPLORATION ACTIVITY (45 minutes)

You are a team of paleontologists working in Big Bend, Texas tracking down fossil remains. Your team has made recent discovery so you will attempt to identify the type of animal based on its fossil remains.

<p>Day 1: On a brisk morning, your team finds 4 well-preserved fossil bones. <i>(Note: Remove 4 bones from your envelope without looking at the ones remaining inside)</i></p>	<p>Day 3: In the final day of your excavation, you find 3 more specimens. <i>(Note: Remove 3 bones from your envelope)</i></p>
<p>What does your fossil look like?</p> <p>What type of animal do you think it is?</p> <p>What about the fossil makes you think that?</p>	<p>What does your fossil look like?</p> <p>What type of animal do you think it is?</p> <p>What about the fossil makes you think that?</p>
<p>Day 2: After a long day, your team has discovered 3 more specimens. <i>(Note: Remove 3 bones from your envelope)</i></p>	<p>Day 4: Back at the lab, you discover another team has found similar remains from the same time period. <i>(Compare your results to the results of another team)</i></p>
<p>What does your fossil look like?</p> <p>What type of animal do you think it is?</p> <p>What about the fossil makes you think that?</p>	<p>What new information did you get?</p> <p>What type of animal do you think it is?</p>

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STUDENT HANDOUT: ELABORATION (45 minutes)

Your team is now back at your research institution. You now find the *Skeletal Resource Manual* with drawings of skeletons of existing animals. Use the drawings to create an assembly of your fossil skeleton. Create a poster with the following information:

- Type of animal you think your fossil was.
- A drawing of what the animal might have looked like.
- Where you think the animal may have lived (in water, land or air) and evidence supporting your conclusion.
- What you initially thought was the animal on the first day of “excavation”.
- Evidence that made you change your interpretation.

Posters will be displayed in a gallery walk. Your team must evaluate three other posters using the rubric provided.

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STUDENT HANDOUT: POSTER EVALUATION

Team: _____

1	2	3	4
Drawing not included. Description of animal's living environment not detailed. No initial conclusion provided. Supportive evidence missing.	Drawing included but vague or unclear. Detailed description of animal's living environment included. No initial conclusion provided and/or supportive evidence missing.	Clear drawing included. Detailed description of animal's living environment included. No initial conclusion provided and/or supportive evidence missing.	Clear drawing included. Detailed description of animal's living environment included. Initial conclusion and supportive evidence provided.

Comments:

Questions:

Team: _____

1	2	3	4
Drawing not included. Description of animal's living environment not detailed. No initial conclusion provided. Supportive evidence missing.	Drawing included but vague or unclear. Detailed description of animal's living environment included. No initial conclusion provided and/or supportive evidence missing.	Clear drawing included. Detailed description of animal's living environment included. No initial conclusion provided and/or supportive evidence missing.	Clear drawing included. Detailed description of animal's living environment included. Initial conclusion and supportive evidence provided.

Comments:

Questions:

Team: _____

1	2	3	4
Drawing not included. Description of animal's living environment not detailed. No initial conclusion provided. Supportive evidence missing.	Drawing included but vague or unclear. Detailed description of animal's living environment included. No initial conclusion provided and/or supportive evidence missing.	Clear drawing included. Detailed description of animal's living environment included. No initial conclusion provided and/or supportive evidence missing.	Clear drawing included. Detailed description of animal's living environment included. Initial conclusion and supportive evidence provided.

Comments:

Questions: