



Before the Dinosaurs

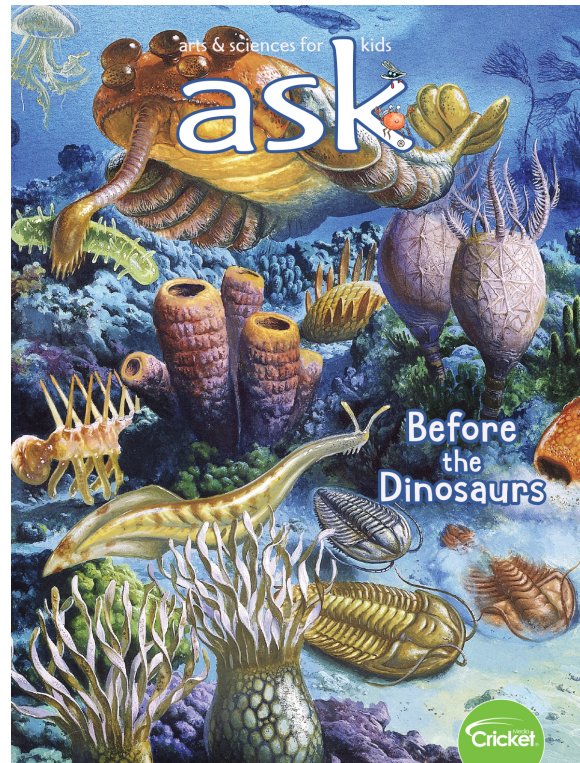
Explore the mysterious life forms that existed on Earth before dinosaurs roamed the land. This issue of ASK examines creatures of the land, air, and sea and describes how they evolved to an ever-changing planet.

CONVERSATION QUESTION

What can we learn from studying life on Earth before the existence of dinosaurs?

TEACHING OBJECTIVES

- Students will learn about the six ages of life before the existence of the dinosaurs.
- Students will learn how animals with similar bone patterns are related.
- Students will learn why roaches are the most successful species on the planet.
- Students will categorize information from a science-based text.
- Students will demonstrate the ability to sequence the process of evolution.
- Students will record the structure and function of the physical features of roaches.
- Students will create a timeline illustrating the six different periods of time before the dinosaurs.
- Students will examine the skeletal system of the human body.
- Students will write a first-person narrative.



In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

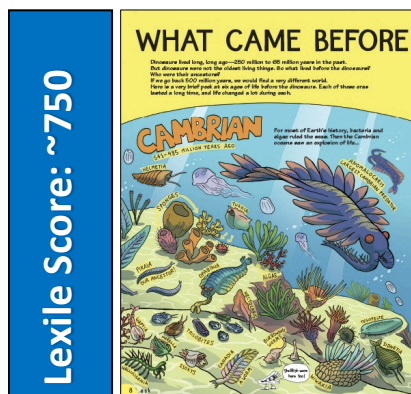
SELECTIONS

- **What Came Before the Dinosaurs**
Expository Nonfiction, ~750L
- **Fins and Fingers, Wings and Hooves**
Expository Nonfiction, ~950L
- **The Secret of My Success**
Narrative Expository Nonfiction, ~550L

What Came Before the Dinosaurs

pp. 8–13, Expository Nonfiction

Journey back in time and explore the world before dinosaurs roamed the earth. Students will learn how some lifeforms became more complex, while others died out during the six ages of life preceding dinosaurs.



RESOURCES

- DINO Bingo

OBJECTIVES

- Students will learn about the six ages of life before the existence of the dinosaurs.
- Students will categorize information from a science-based text.
- Students will create a timeline representing the six ages before the dinosaurs.

KEY VOCABULARY

- **diverse** (p. 9) showing a great deal of variety; very different
- **teem** (p. 9) to be full of or swarming with
- **tetrapods** (p. 12) four-legged amphibians

ENGAGE

Conversation Question: What can we learn from studying life on Earth before the existence of dinosaurs?

Have students fold a piece of paper into thirds and label each section: Life BEFORE Dinosaurs, Life WITH Dinosaurs, Life AFTER Dinosaurs. Give the class five minutes to sketch/write their thoughts about each period of time. Share responses prior to reading.

INTRODUCE VOCABULARY

Review the key vocabulary with the class. Guide students to notice that the words all have a different number of syllables. Have students divide a piece of paper into three columns with the following headings: One-syllable words/Two-syllable words/Three-syllable words. Instruct the class to properly partition each key term and place it in the correct column. As a post-reading activity, have the students search the article for other dinosaur-related nouns that they can add to each column.

READ & DISCUSS

Pose the following questions to the students following the reading of the article to facilitate meaningful conversation.

- How many ages of life were there before the dinosaurs? List them in order.
- What happened during Ordovician Extinction?
- What happened at the end of the Devonian age when there were rapid changes in climate and a decrease in oxygen in the ocean?
- How did early tetrapods adapt to life on land?

CONCEPT/SKILL FOCUS: Categorizing Information

INSTRUCT: Have students study the article, “What Came Before the Dinosaurs,” with a partner. Then, instruct them to draw a five-row by five-column grid with 25 boxes. Have them indiscriminately fill in all the boxes with letters to represent the periods discussed in the text. (CN=Cambrian, OR=Ordovician, SL=Silurian, DV=Devonian, CS=Carboniferous, PN=Permian) Read the clues on the following page in random order and have students identify and mark the period on their chart that the statement corresponds to. This bingo-format game is won when a player marks five in a row and yells, “DINOS!”

ASSESS: Observe different groups of students as they are playing DINO Bingo. Pause and have students justify their categorizations.

EXTEND

Science Have students create a timeline and place each of the six periods in the correct place on the line. They should include the time frame. Then have students select one animal to represent each era and place a drawing of it above the corresponding period.

DINO BINGO CLUES

Have students make a 5x5 bingo board as directed in the Concept/Skill Focus section of the guide. Then read the clues below aloud in random order and have students mark the appropriate box until a player gets 5 in a row and yells, DINOS!

Cambrian Clues:

- The seas saw an explosion of life that included sea sponges.
- This period of life included burrowing worms.
- This period's largest predator was the anomalocaris.
- This was the first of the six ages before the dinosaurs existed.
- This age took place more than 500 million years ago.

Ordovician Clues:

- Ocean life becomes more diverse and ancestors of starfish appear.
- Mosses are the first plant to colonize the land.
- Horseshoe crabs come into existence.
- Jawless fish, ancestor to all fish, fill the seas.
- The first coral reefs appear.

Silurian Clues:

- Sea Scorpions are the top predators of the sea in this age.
- The Jawless fish disappear.
- On land, plants grew stems and spread.
- Small bugs begin to inhabit the earth.
- The first vertebrates appear.

Devonian Clues:

- On land, trees develop seeds, allowing them to spread to dry places.
- The largest creatures in the ocean are the placoderms, or armored fish.
- This age is known as "The Age of the Fishes".
- Much animal and plant life was wiped out at the end of this period.
- Some fish learn to breathe air on land and become the first amphibians.

Carboniferous Clues:

- Huge amphibians become top predators of rivers and lakes.
- Early tetrapods adapt to life on land.
- Some amphibians start laying eggs with a hard shell.
- The forests that grow during this period will fossilize and become the coal that we dig up today.
- This is a hot and muggy period that took place 355–299 million years ago.

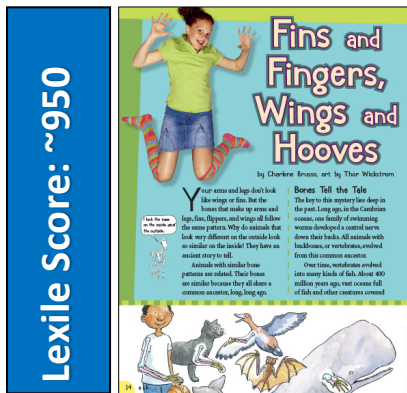
Permian Clues:

- The first ancestors of the dinosaurs appear, known as the archosaurs.
- Synapsids, the ancestors of mammals, roam the earth.
- The largest mass extinction occurs, possibly caused by a volcanic eruption, wipes out 70% of land and 95% of ocean species.
- This period is cooler and drier, allowing seed plants and egg-laying tetrapods to spread out across the land.
- This was the last age of life before the dinosaurs.

Fins and Fingers, Wings and Hooves

pp. 14–17, Expository Nonfiction

From fins to fingers, students will learn how all animals with vertebrae evolved from a common ancestor. Students will study how animals with similar bone patterns provide evidence of such a relation.



RESOURCES

- Funny Bones

OBJECTIVES

- Students will learn how animals with similar bone patterns are related.
- Students will study the sequence and process of evolution.
- Students will examine the skeletal system of the human body.

KEY VOCABULARY

- **evolved** (p. 15) developed gradually, especially from a simple to a more complex form
- **limbs** (p. 15) arms or legs of a person or a four-legged animal or a bird's wing
- **vertebrates** (p. 14) animals of a large group distinguished by the possession of a backbone or spinal column

ENGAGE

Conversation Question: What can we learn from studying life on Earth before the existence of dinosaurs?

An animal track is an imprint left behind in soil, snow, mud, or some other ground surface by an animal walking across it. Have students use books or a website (<https://www.almanac.com/content/animal-track-identification>) to study a chart of animal tracks. Consider how the bone structure and of animal limbs explains the types of tracks they produce.

INTRODUCE VOCABULARY

Review the key terms and definitions with the class. Guide students to notice that each word belongs in a different part of the alphabet. (Beginning: A–I, Middle: J–R, End: S–Z) Have them write these headings at the top of their paper and put each word in the correct category. As a post-reading activity, have students add other theme-related words from the article to their list in the correct columns.

READ & DISCUSS

Read aloud the following questions prior to reading the text. Advise students to note where in the article those answers are found. Discuss responses to the questions as a post-reading activity.

- Why does the article say that your bones have an ancient story to tell?
- What happened when fins changed into limbs?
- What is the difference between ray-finned and lobe-finned fish?
- How does the evidence prove that many different animals can be related to each other?

CONCEPT/SKILL FOCUS: Sequence and Process

INSTRUCT: Guide students to articulate that the main idea of this article is to explain how animals with similar bone patterns are related. Distribute the graphic organizer, *Funny Bones*, and tell students that they will be using information from the article to study and sequence the evolutionary process that started with swimming worms and ended with primates.

ASSESS: Circulate and discuss the article's content with students. Examine graphic organizers to further evaluate their individual understanding of the studied process and their ability to properly sequence it.

EXTEND

Anatomy Provide students with a skeleton diagram of the human body. Have students identify the four major classifications of bones (long bones, short bones, flat bones, and irregular bones). Challenge students to use resources to categorize as many of the 206 bones of the body as they can into these four groups.

Funny Bones

*Describe the process of evolution by rewriting the statements below in the proper order on the lines provided.
Use the completed sheet to retell the story of evolution to a classmate or family member.*

- Vertebrates evolved into many kinds of fish.
- Some clawed animals developed into primates.
- The earliest tetrapods roamed the earth.
- Swimming worms developed a central nerve down their backs.
- Lobe-fin fish developed limbs.
- The length of the tetrapods' limbs changed and some developed wings or claws.

1. _____

2. _____

3. _____

4. _____

5. _____

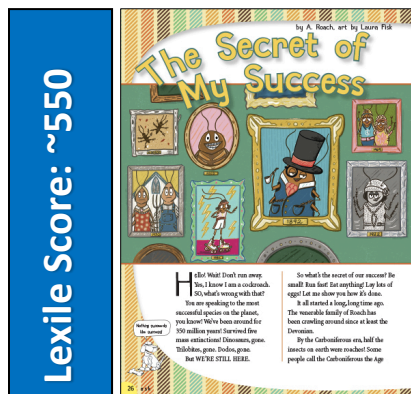
6. _____

The Secret of My Success

pp. 26–28, Narrative Expository

Nonfiction

Lights on . . . roaches scatter and humans shudder. Students will enjoy the whimsical tone of this informative article that details the amazing resiliency of roaches.



RESOURCES

- Super Species

OBJECTIVES

- Students will learn why roaches are the most successful species on the planet.
- Students will record the structure and function of the physical features of roaches.
- Students will write a first-person narrative.

KEY VOCABULARY

- **exoskeleton** (p. 27) the external skeleton that supports and protects an animal's body
- **larva stage** (p. 28) an independent, immature stage in the life cycle of an animal, in which it is markedly unlike the parent and must undergo changes in form and size to reach the adult stage

ENGAGE

Conversation Question: What can we learn from studying life on Earth before the existence of dinosaurs?

Give students three minutes to list things that are “indestructible.” Ask for volunteers to share their lists. Note what responses appear frequently among the class. Prompt students to think critically beyond human-made materials.

INTRODUCE VOCABULARY

Post the vocabulary words where they are visible to the class. Instruct students to do a word hunt through the article to locate these words. Have them underline the sentences in which they appear. Challenge students to use context clues to determine meanings. Discuss actual meanings and add definitions to the terms posted on the board.

READ & DISCUSS

Reinforce comprehension of concepts in this article by arranging students in small groups to answer the following questions.

- Why are roaches considered the most successful species on the planet?
- What are some of the enemies of roaches?
- How have roaches avoided mass extinctions?
- What is unique about how roaches hatch?
- What methods have scientists tried to get rid of roaches?

CONCEPT/SKILL FOCUS: Structure and Function

INSTRUCT: Elicit from students that the main idea of the article is to provide information that details how roaches have survived mass extinctions and are considered the most successful species on the planet. Present the graphic organizer, *Super Species*, and tell students that they will be using information from the article to record the special function of each physical feature listed. They will be essentially recording how each body part has helped roaches to survive and thrive.

ASSESS: Collect and review the graphic organizers, as well as their questions from the vocabulary activity to determine understanding.

EXTEND

Language Arts This article is written using a first-person perspective that voices a roach's thoughts. Review that a first-person narrative is a mode of storytelling in which a narrator relays events from their own point of view and uses the word “I” or “We.” Have students choose an animal and write from its perspective. Instruct them to use factual information in their storytelling, so that their writing provides the reader with real information.

Super Species

Refer to the article, "The Secret of My Success," and record how each physical feature has helped roaches to survive mass extinctions and to become the most successful species on the planet.

Structure (body part)	Function (What is the purpose of this feature?)
antennae	
body	
wings	
stomach	