



Postulating Pressures

8th Grade

Duration

Pre-Visit: 30-50 minutes

Museum Visit: 60 minutes

Post Visit: 50 minutes

Location

Age of Mammals Hall

Supplies

- Worksheet
- Pencil
- Clipboard (optional)

Standards

[NGSS](#)

MS-LS1-4, MS-LS2-1, MS-LS2-3, MS-LS4-1, MS-LS4-2, MS-LS4-2, MS-LS4-4, LS4.A, LS4.B, LS4.C

[S+E Practices](#)

1, 2, 3, 4, 6, 7, 8

[CCSS ELA](#)

W.1.2.3.4.7.9,
WHST.1.2.7.8.9, L.2

[CA State](#)

Writing Applications
2.3.a.b.c.d

Investigation and
Experimentation 9.a

Vocabulary

Evolution · Climate ·
Adaptation · Predator ·
Prey · Natural Selection ·
Food Sources · Geology ·
Fossil · Comparative
Anatomy

Concepts

- Natural Selection is the mechanism by which evolution occurs. Genetic variation and environmental pressures are important parts of natural selection, and thus evolution.
- Evidence from geology, fossils and comparative anatomy provide the bases for the theory of evolution.
- Extinction of a species occurs when the environment changes and the characteristics of a species are insufficient for its survival.

Objectives

- Students will formulate hypotheses about selection pressures on an organism based on observations.
- Students will research an organism to find if their hypotheses are supported by evidence.
- Students will choose a project in which they will use present and apply their research.

Outline

1. In one classroom session before visiting the Museum, review vocabulary and the concept of evolution by natural selection. Have students select a mammal to focus on for their research paper and begin formulating hypotheses.
2. During a trip to the Museum, students will explore the Age of Mammals hall and begin researching their animals natural history.
3. Back in the classroom and or at home, students continue independent research choose one project from the Task Sheet to showcase their findings.

Pre-Visit

In your classroom, print out and distribute the vocabulary list (Vocabulary) and list of potential research candidates (Postulating Pressures/Pick Your Project). Review the concepts of evolution by natural selection and adaptation using the vocabulary and four images of specimens (following this page). You may choose to show these as a digital slideshow, or print them out.

Observe each of the four images together and discuss the animals using the following questions to help guide the discussion: Encourage students to use appropriate vocabulary.

- **What do you notice about this animal?**
Note: For the purposes of this project, focus on anatomical adaptations that can be observed via pictures or specimens. Though physical adaptations *may* suggest behavioral ones!
- **What might that be an adaptation for?**
Encourage students to not only identify what the adaptation is, but also hypothesize what it might be used for. For example, they may point out a Saber-toothed Cat's large canine. What might those canines be used for? How might they be used?
- **What do you see that makes you say that?**
By asking this, students are asked to justify their hypothesis with evidence they can see. More evidence to support (or not) will be collected at the Museum and during individual research time.
- **What kinds of selection pressures might have resulted in those adaptations?**
Encourage students to think about what kinds of selection pressures might perpetuate or drive an adaptation to exist. Consider: changing environments and climate, interactions with other animals such as competition for food, mates or other resources, etc.

At this time, explain that they will be conducting a research project investigating selection pressures - why might a mammal have evolved certain adaptations?

Have students select the project they would like to do and a mammal to focus on. This can be done in groups or as individuals. If you choose, they may begin the next worksheet (*My Mammal/Focusing the Research/Hypothesize*) in the classroom or at home.

Museum Visit

Distribute the graphic organizer (Research) to students. Have students locate their selected mammal in the Hall and using it to gather primary source information related to their mammal. Copious note takers may need additional paper. Encourage critical thinking and specific note taking.

Post-Visit

Back in the classroom (or as homework) have students continue to conduct independent research to further investigate why a mammal might have evolved certain adaptations and continue work on their project. See the included rubric for suggested evaluation guidelines.

Variations & Extensions

- Have students share findings informally in the Age of Mammals hall.

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Walking Whale

Pakicetus attocki



Pygmy Sperm Whale

Kogia breviceps



Cheetah

Acynonyx jubatus



Sabertoothed Cat

Smilodon fatlis



Vocabulary List

Review and become familiar with these terms prior to visiting the Natural History Museum

Vocabulary	Definition
Evolution	The change in organisms (as a consequence of changes in their genes) over time due to selective pressures from their environment.
Climate	Temperature, humidity, atmospheric pressure, wind, rainfall, and numerous other meteorological elements in a given region over long periods of time.
Adaptation	A feature an animal has (physical) or does (behavioral) feature that is important for its animal's survival.
Predator	An animal or organism that eats other animals or organisms for its food.
Prey	An animal or organism that is consumed by a predator for food.
Natural Selection	The process through which traits that aid survival and reproduction become more common, and traits that hinder survival and reproduction become more rare.
Food sources	Where and how an organism gets its food.
Geology	The study of the earth and its history as recorded in rocks and minerals
Fossil	Evidence of pre-historic life. A remnant or trace of an organism of a past geologic age, such as a mineralized skeleton, leaf imprint, invertebrate trapped in amber, or mummified and frozen organisms.
Comparative Anatomy	The study of similarities and differences in the anatomy of organisms.
Selection Pressure	A force that causes a particular organism to evolve in a certain direction, i.e. the forces that drive Natural Selection



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Choose an animal below to investigate more closely for your research project:

Extant

- Polar Bear (*Ursus maritimus*)
- Common Zebra (*Equus quagga burchelli*)
- Sumatran tiger (*Panthera tigris sumatrae*)
- Alpaca (*Lama pacos*)

Extinct

- Bone-cracking dog (*Epicyon haydeni*)
- Early Mammal (*Miniochoerus gracilis*)
- Harlan's Ground Sloth (*Paramylodon harlani*)
- Giant Nebraskan Camel (*Titanotylopus nebrakensis*)

Pick Your Project

Choose one of the projects below based on the levels of *Bloom's Taxonomy*. Keep in mind that each task will require thorough research and quality completion of the Graphic Organizer from the Museum visit.

Remember

Write an essay summarizing the daily life of your chosen mammal. Focus on recalling important facts about your food, habitat, and survival.

Understand

Research your animal's habitat and the way it changed during the Cenozoic Era. Use that information to write an essay describing what would have happened to your mammal if those environmental changes had not occurred.

Apply

Illustrate or create a model of your chosen mammal in its natural habitat. Label the drawing or model and write an essay that describes the challenges of this mammal at the moment in time you chose to portray.

Analyze

Create a PowerPoint presentation that examines the relationship between climate changes, habitat, and the survival of your chosen mammal, as well as displays your knowledge on the mammal itself. Be prepared to present it to the class.

Evaluation

Assess the impact that humans are currently having over the natural habitat of your chosen mammal (or a similar mammal if yours is extinct). Determine the value of these changes and present your viewpoint in a comprehensive essay. Consider both human and animal rights to enhance your argument.

Create

Identify and consider the physical characteristics of your chosen mammal. Decide how your mammal would make improvement to the physical make-up of the mammal, and create a new mammal that would successfully live within this habitat and write an essay that details your new species.



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My Mammal

Common Name:

Scientific Name:

Focusing the Research

Write down three adaptations you notice on your animal you might like to investigate more closely in your research. *These are just a jumping off point, you may include others you find interesting in your project!*

1.

2.

3.

Hypothesize

Using observations as evidence, write down some ideas about what kinds of selection pressures might have resulted in the adaptations listed above.



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Research

Locate your mammal in the hall and use the space below to record notes from the exhibit. Be specific, include sketches where you can, and use additional paper if necessary.

Focus on FOOD

CONSIDER: What did your mammal eat? How did it get food? Was the food source reliable? Did the food source change over time?

Focus on HABITAT

CONSIDER: What are/were aspects about your animals environment ? Did the environment change over time? In what ways is/was your mammal adapted for this environment?

Focus on OTHERS

CONSIDER: What other animals shared the environment with your animal? Did they cause challenges for your mammal? How did your mammal respond?

Research Project Scoring Guide

Student Name:

Project:

	Criteria	Score
Ideas	Student has spent time researching his/her chosen topic and incorporated specific information into the project. There is clear evidence of information found at the Museum as well as information found from other resources. Notes:	/15
Voice	Student delivers the information and keeps the writing and presentation concise, clear, and specific. Notes:	/5
Presentation	Student has taken the time to capture the essence of the Chosen Task with attention to detail and neatness. Notes:	/5
Conventions	Student composes the writing with attention to capitalization, spelling, usage, and punctuation. Proper citation of research materials is present. Notes:	/5
Word Choice &	Student has made strong word choices that showcase the student's knowledge on the subject. Sentences are written with care for fluency and transition between thoughts. Notes:	/5
	Total Score	/35