

Considering the Evidence for Mass Extinctions

At least five times in Earth's past, the vast majority of plant and animal species have been annihilated in a geologic instant. What triggered these dramatic events, and what might they tell us about the fate of our world? What do we know about Earth's past history, and what does science tell us about the coevolution of Earth's systems and life?

EarthViewer is an application that is available for [download for computers](http://media.hhmi.org/biointeractive/earthviewer_web/earthviewer.html) (http://media.hhmi.org/biointeractive/earthviewer_web/earthviewer.html) or it can be installed on [tablet devices](#) (iPad or Android).

1. Launch and explore the features of [EarthViewer](#):

- Click, hold, and drag to rotate the planet.
- Click, hold, and drag down the horizontal silver slider on the timeline; watch what happens to the planet and the data indicators as you move backward and forward in time.
- Position the silver timeline slider at 0 MYA (top of the timeline). Click on the left "play" button at the bottom of the timeline; watch what happens.
- When the silver bar stops at the bottom, click on the right "play" button and watch again.
- Position the silver timeline slider at 0 MYA. Click on "Charts" at the bottom of the screen.
- Choose a chart. Watch what happens on your chosen chart as the slider moves down the timeline.
- Close your chart in EarthViewer by clicking on the "X" in the upper right-hand corner.

2. Make sure the timeline displays 0–540 million years (Paleo Earth) and then click on "View" at the bottom of the screen; turn on "Mass Extinctions." Click "View" again to minimize the menu.

3. Note the five yellow triangles that appear on the right side of the timeline. These correspond to mass extinctions

4. Gather data: Drag the slider to the Ordovician extinction, 440 MYA. Use the EarthViewer features to fill in the following chart. For temperature, CO₂, and O₂, note whether these measures were increasing, decreasing, or constant at the time of the extinction. For Biodiversity, you will need to move the slider carefully and record the number of marine genera present just before and just after the extinction event. Gather data in the same manner for the remaining four mass extinctions.

	MYA	What did earth look like? (landmasses, water, ice?)	Avg. temp. trends	O ₂ trends	CO ₂ trends	Marine biodiversity (before)	Marine biodiversity (after)
Ordovician							
Devonian							
Permian							
Triassic							
Cretaceous							

5. Do any patterns and correlations emerge from your chart? Do any of the data suggest an explanation for the occurrence of mass extinctions?

6. Calculate the marine biodiversity loss in each extinction and report in terms of percent.

Ordovician:

Devonian:

Permian:

Triassic:

Cretaceous

7. Return to EarthViewer. Move the slider down to each extinction and click on the link. Read the information about each extinction and note the main hypothesized causes and results of each extinction event. Do your data in the chart match the hypothesized causes? Do your % biodiversity calculations match what is stated? Why might there be discrepancies?

Ordovician:

Devonian:

Permian:

Triassic:

Cretaceous:

8. For the Cretaceous extinction, suggest at least three lines of evidence that might have led scientists to the conclusion that an asteroid impact caused the extinction. Discuss your predictions and record your ideas in the space below.

9. Read about the evidence for an asteroid impact at:

<https://www.pbs.org/wgbh/evolution/extinction/dinosaurs/asteroid.html>

What evidence has been reported? Does the evidence match your predictions?

10. Why do you think that scientists do NOT hypothesize that an asteroid impact caused the Permian-Triassic extinction? Discuss your thoughts with your partner and record your ideas in the space below. If you have time, search online for more information about the Permian extinction. What is the current state of thinking about the causes of this extinction?