Traveling Back in Time through Seafloor Cores

This activity was adapted from the Scientific Ocean Drilling Coordination Office's *Cretaceous Impact Kit* for Earth Science Week 2026.

MATERIALS

- Computer with internet access

INTRODUCTION

Have you thought about traveling back to the time of the dinosaurs to find out why they went extinct? With cores collected from the seafloor, you can do just that! Because sediment deposits build up on the seafloor over time, cores of the sediment contain records of what our planet was like long ago. With this activity, you can explore the evidence that a gigantic asteroid hit Earth about 65 million years ago and had major impacts on our planet!

PROCEDURE

1. Sixty-five million years ago, an asteroid roughly 10 km-wide slammed into what is now Mexico's Yucatán Peninsula, carving out the 177 km-wide Chicxulub crater and triggering mass extinctions across the globe, including the extinction of the non-avian dinosaurs.

    a. Before looking at any evidence:
        - Consider: what do you think an asteroid impact is like? How might an impact affect the site where it hits? How might it affect areas that are farther away? Describe potential effects on the biosphere, geosphere, and hydrosphere.
        - Predict: what kinds of clues might scientists find in seafloor sediment that would support the idea an asteroid impact happened millions of years ago?

2. In 2016, scientists drilled directly into the Chicxulub crater during Expedition 364, pulling up cores that captured sediment from the moment of the asteroid impact, as well as sediment that accumulated before and after the event.

a. Look at core section 364-M0077A-40R-1, which contains the Cretaceous/Paleogene (K-Pg) boundary — the exact layer marking the day the impact occurred: https://bit.ly/K-Pg-boundary-core-closeup.
b. Record observations about the layers above and below the boundary: color, texture, grain size, and any sudden changes.

3. Seafloor cores contain many minerals. Check out these cores from the site of the catastrophic asteroid impact off the coast of Mexico: https://bit.ly/seafloor-cores-EXP364. While you may want to look at many images from this collection, focus on the first image to answer the following questions:

   a. How many different types of minerals do you think this core contains? What evidence did you use to differentiate the minerals from each other?
   b. It's normal if you can't identify minerals on sight — that's exactly why scientists use microscopes and other lab instruments to test the minerals' properties. What might you want to know about the minerals to be able to identify them?
   c. Two of the most important clues found in this core are:

      - **Iridium** — an element that is rare in Earth's crust but common in asteroids. A spike in iridium in sediment marks when an asteroid impact. Iridium is also often contained in the dust that is spewed into the air during an asteroid impact, meaning that sediment containing iridium can also settle for miles away from the impact site (and depending on the size of the asteroid, this sediment can spread around the world!).

      - **Shocked quartz** — ordinary quartz grains within the ground can be instantly deformed by the extreme pressure of the impact, leaving microscopic fracture patterns that can only form during a high-energy collision.

ANALYSIS

1. Describe the differences you observed between the layers above and below the K-Pg boundary in Step 2.

2. Why do you think iridium and shocked quartz are considered strong evidence for an asteroid impact, rather than some other kind of event, like a volcanic eruption?

3. The K-Pg boundary layer has been found in seafloor cores and rock outcrops all over the world, not just near Mexico. What does that tell you about the scale of this specific asteroid impact event?

4. If you were a scientist studying this core, what other questions would you want to investigate next?

FURTHER STEPS

This activity contained just a few of thousands of cores that are like pages from Earth's history book. Explore minerals and evidence recovered from other ocean cores to see how scientists use seafloor sediment to reconstruct everything from ancient climates to earthquakes: https://joidesresolution.org/science-skills-classroom-activities/.