Activity Ideas

- Start off with the same phenomena early explorers and scientists had—the fossil. Give students a copy of the fossil image and ask them to observe it and write down questions it inspires (SEP: Asking Questions) in their science notebooks.

- Before starting the book, ask students to answer the following questions:
    - What does a scientist look like? Draw a scientist.
    - Describe a typical path a person might take to become a scientist.

  While reading the book, make a study of Jesse Pruitt and his colleagues, and potentially change student perception of what a scientist, and the path to becoming a scientist, might look like. In the book's introduction, the author refers to the *Helicoprion* researchers as "a quirky band of boundary-bending collaborators that looked more like a roots-rock band than ivory tower intelligentsia." (NGSS: Understandings about the Nature of Science)

- How Science Works - this book is an accurate portrayal of how the process of science advances our understanding of a topic over time. Watch the How Science Works video. Then use the Real Process of Science diagram to chart out the process of science as it relates to our understanding of *Helicoprion*. The table below points out a few of the key occurrences in the process. (NGSS: Understandings About the Nature of Science)

Event	**How it fits into process of science**
Initial Australian *Helicoprion* fossil discovery	Exploration and Discovery: making observations
Observations of initial fossil by various people	Community Analysis and Feedback: discussion with colleagues
Paper classifying *Helicoprion* as new genus by Karpinsky	Testing Ideas: hypothesis/Community Analysis and Feedback: publishing
Ray Troll observes Helicoprion fossil in L.A. County Museum basement	Serendipity
Jesse Pruitt and Leif Tapanila share CT scan data with other researchers.	Exploration and Discovery: sharing data and ideas

- Create a timeline (could use online platform such as www.timetoast.com) that spans both recent and prehistoric times. This could be two timelines. Add significant events related to the *Helicoprion* life history and the advancement of our scientific understanding of *Helicoprion* as significant events occur while reading the book. A

Helicoprion Research Timeline and Helicoprion Evolutionary History Timeline are included for reference. (CCC: Scale, Proportion and Quantity; DCI: ESS1.C The history of planet Earth; SEP: Modeling)
    - Evolutionary history of Helicoprion: 270-280 million years ago (span of ~10 million years)

- Shark dissection - Complete an actual or online study of shark anatomy to better understand why only teeth might fossilize and cartilaginous skeleton would not, as well as comparative anatomy. Shark specimens may be purchased from companies such as Carolina Biological). (SEP: Planning and carrying out an investigation; CCC: Structure and Function; DCI: LS4.A Evidence of common ancestry and diversity)

- Compare and contrast ammonite and *Helicoprion* fossils. (SEP: Planning and carrying out an investigation; CCC: Structure and Function; DCI: LS4.A Evidence of common ancestry and diversity and LS1.A Structure and Function)

Português: Fóssil de amonite encontrado na Serra de Montejunto, Portugal., 8 July 2012, LMCoelho

By James St. John [CC BY 2.0 (https://creativecommons.org/licenses/by/2.0)], via Wikimedia Commons

- Play the role of a historical scientist and use fossil evidence to defend an argument - the Helicoprion fossil represents teeth OR fin spines (or something else). Seek original sources to find evidence based arguments. (SEP: Engaging in argument from evidence)

- Using the descriptions of time periods on pages 81-89 and 93, create a visual diagram of geologic time and the evolution of life. (CCC: Scale, Proportion and Quantity; SEP: Modeling)

Extensions

- Research the five mass extinctions on planet Earth. When did each occur? Why? What became extinct and how? (CCC: Cause and Effect; SEP: Engaging in Argument from Evidence and Obtaining, Evaluating and Communicating Information; DCI: LS4.C Adaptation; LS4.D Biodiversity and Humans)

- Find and compare examples of spiral patterns in nature in addition to ammonites and shark tooth whorls (hurricanes, fern fronds, etc.). (CCC: Patterns)

- Assign students different influential people from the history of geology and paleontology to study and report about their roles:
    - William Smith
    - James Hutton
    - William Buckland
    - Charles Lyell
    - Othniel Charles Marsh
    - Edward Drinker Cope
    - Nicholas Steno
    - Robert Hooke
    - Georges Cuvier
    - Joseph Leidy
    - John Strong Newberry
    - Miss Fanny Rysan Mulford Hitchcock
    - Sir Richard Owen