

Grades: 9-12

Nova “Polar Extremes”

Join renowned paleontologist Kirk Johnson on an epic adventure through time at the polar extremes of our planet. Following a trail of strange fossils found in all the wrong places-- beech trees in Antarctica, hippo-like mammals in the Arctic--Johnson uncovers the bizarre history of the poles, from miles-high ice sheets to warm polar forests teeming with life. What caused such dramatic changes at the ends of the Earth? And what controls the dial on Earth's thermostat? Today, the Arctic is warming faster than anywhere else in the world, and Antarctica has locked in its ice enough water to raise sea level by a terrifying 200 feet. The way that the poles respond to a warming climate is one of the greatest wildcards in predicting our climate future. Johnson uses Earth's history, written in stone, as a cipher to decode what is going on at our polar extremes today, and what the future may hold.

After watching this episode, choose from the following questions and/or tasks to extend your learning.

Question Box 1

- How far is 12 billion miles?
- What details can you give about the interstellar ship known as the Voyager?
- What did the images Voyager beamed back tell us about other planets in our universe?
- What bigger surprises did the moons of our universe's planets reveal?
- What is the Golden Record and why was it included in the Voyager mission?
- Why has the Voyager mission earned its place in the pantheon of human achievements?

Question Box 2

- What surprised you in the program, and why?
- What's the most important thing you learned from the TV show? Why do you think so?
- What in the program made you curious? Explain.

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Box 3 (Tasks)

- How many miles has the Voyager traveled on average per year? It cost \$250 million dollars to develop. Use mathematics to justify or denounce the cost of the Voyager.
- 5 trillion bits of scientific data have been processed from the Voyager since it first launched. That much information can fit onto more than 7000 music CDs. How many person hours do you think that it would take to analyze all of that information? Use mathematics to justify your reasoning.
- Research the Voyager project and make a claim with evidence as to whether or not the Voyager has left our solar system.
- Discuss how the Voyager is powered to sail forever through the cosmos. What physical principles are in effect?

Box 4 (Enrichment)

- Make a timeline that details the projects that led up to the Voyager project, and the projects that stemmed from it.
- Research the Drake Equation and explain, using the equation, why the Voyager might be the only evidence that we ever existed.

Box 5 (Extend/Real-Life)

- Suppose you were tasked with preparing the “Golden Record” that announced the Earth civilization to the world. What would you put on it and why?