National Center for Science Education

Defending the Teaching of Evolution in Public Schools

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Guide to *Episode 2: Great Transformations*

For a 45–60 minute dialogue on Episode 2 of *Evolution*

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"If one small and odd lineage of fishes had not evolved fins capable of bearing weight on land..., terrestrial vertebrates would never have arisen. If a large extraterrestrial object — the ultimate random bolt from the blue — had not triggered the extinction of dinosaurs 65 million years ago, mammals would still be small creatures, confined to the nooks and crannies of a dinosaur's world, and incapable of evolving the larger size that brains big enough for self-consciousness require. If a small and tenuous population of protohumans had not survived a hundred slings and arrows of outrageous fortune (and potential extinction) on the savannas of Africa, then Homo sapiens would never have emerged to spread throughout the globe. We are glorious accidents of an unpredictable process with no drive to complexity, not the expected results of evolutionary principles that yearn to produce a creature capable of understanding the mode of its own necessary construction."

— Stephen Jay Gould, *Full House* (New York: Crown Publishers, 1996), 216.

Image

A scientist places the bones from a human hand and arm beside the bones from the fin of a 370-million-year-old fish fossil to show the similarities in structure.

Dig

What feelings did this comparison evoke in you? The major transformations in evolution explored in this episode have left a legacy in persistent forms. Even when we understand evolution, though, we may still want to think of our human existence as inevitable, but, as Donald Johanson points out, "like every other species we are here because of a series of chance coincidences, specific adaptations and chosen opportunities." How do the themes and images of this episode help to answer the questions posed by the narrator at its beginning: "Who are we? Where do we come from? How did we get here? Why do we look the way we do?"

Dialogue

The question of "why do we look the way we do" may be addressed with answers from evolutionary thinking, from paleontology and genetics. But some of the other questions on the narrator's list admit to many levels of answers.

> How would you answer the question "Who are we?" from a scientific perspective?
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> What would you say? And what would be your evidence for saying it?
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> How would you answer the question "Who are we?" from a faith perspective? What sources from your faith tradition would you point to in order to support your statements?
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> Where do these two sets of answers overlap? Reinforce one another? Challenge one another?

Explore

1. For background reading on two of the great transformations, the emergence of tetrapods and the evolution of whales, dolphins, and porpoises, a volume for the general reader is *At the Water's Edge: Macroevolution and the Transformation of Life* by Carl Zimmer (New York: The Free Press, 1998).

2. There are many references to chance and purposelessness in this episode. These concepts can be an unsettling notion for people of the Abrahamic faiths, and one not easy to explore in a brief conversation. Evolutionary thinking is not oriented toward the future or endpoint. The writings of Stephen Jay Gould provide the most readable insights from a scientific perspective, while those by John F. Haught cited in these guides shed the most light from a theological one. Perhaps some members of your group will want to do more reading and thinking in this area.

Act

One of the claims made in the episode is that the evidence for evolution is all around us if we choose to look for it. Where have you seen this evidence? How might you become more attuned to look for it? If you have children or grandchildren, how might you help them see the evidence for evolution in the world around them?

Please send comments on these guides, and any questions about ideas and resources for extending the conversation, to:

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