



Extraterrestrial Odds:

A Case for Life Beyond Earth

Use a little bit of math and probability to explore one of science's biggest questions with Dr. B.



Watch the show!



https://www.youtube.com/watch?v=s_i-5japriM

Quick Questions

1. Dr. B lists a few examples of big questions at the beginning of the episode. What big questions do you have (about anything)?
2. Have you ever thought about the possibility of life on other planets? Do you think it exists?
3. Have you heard of exoplanets before?
4. Life as we know it means life that is carbon-based. Do you think life could be based on other elements?
5. Math is a very important tool in science. Our understanding of whether extraterrestrial life is possible relies on areas of mathematics like probability: we may not have found life on other planets yet, but we can calculate the likelihood of it existing. Were you surprised that math contributes to our understanding of this big science question?

Deep Dives

1. What reaction do you have to the possibility of life on other planets? Does the idea concern you? Does it make you happy or excited? What possible benefits do you see to the knowledge that there is life on other planets? What possible risks are there?
2. The numbers shared in this segment—like 70 septillion—are really big numbers. It can be difficult to imagine numbers so vast. Think of something that there is a LOT of, like grains of sand on Earth. Imagine trying to inspect each grain of sand one by one. How long, or how many people, do you think it would take? How does that relate to looking at all of the existing planets for life?
3. Although we have yet to find confirmation of life on other planets, many scientists agree that due to probability, the likelihood is high. What have you heard people say about extraterrestrial life? Why do you think some people are so interested in this topic? Do you think they form their opinions about it through scientific information, pop culture, the news, or something else?
4. Think about the huge variety of life on our planet, from single-celled organisms like bacteria to multicellular organisms like animals and plants. Popular media often depicts extraterrestrial life as human-like: they have faces with eyes, a nose, and a mouth, they stand on feet, etc. But in reality, there is no reason to believe this is true. For example, life could be single-celled, or it could be plant or coral life. Or, it could look unlike anything we've ever seen before. Does this reimagining of life impact your understanding of the likelihood of life on other planets? Why or why not? What do you imagine life to be?
5. When we think about the conditions necessary for life, we are often inclined to think about what we are familiar with on Earth. However, even on Earth, there is a huge variety of unique organisms living in different conditions. Imagine you want to be the first scientist to find extraterrestrial life. You know there are billions of planets in the universe, each with many unique environments. You need to choose which planets are most likely to support life. Some may suggest searching only planets like Earth, while others may want to search for planets unlike Earth. What are the pros and cons of each strategy? Which would you pick, and why?

Engaging in Science Discussions



Recommended Grade Level: Middle and High School

Objective: To engage in open-ended discussions about critical science topics. While leading these discussions, it is important to ensure that everyone is heard, and everyone is treating one another with respect. There is no “right answer” during these discussions, and it’s okay to respectfully disagree.

Additional Notes: We recommend having these discussions multiple times with the same group of participants. This provides the opportunity to explore different topics and improve one’s abilities to have successful conversations about STEM topics. Quick Questions are optional and are recommended to be used as warm-up questions.

Materials: TV or projector Paper and writing utensils

TIMELINE (30 – 40 MINUTES)

5 min	10 min	5 min	10 min	10 min <i>(optional)</i>
Intro + prompts	Watch segment	Think/write time	Share with partner	Small groups

Intro (5 min) Before starting, select one Deep Dive question. Tell the group you will be asking them a question that has no right or wrong answer. After they watch the clip, they will have time to think about and write their response. They will share their response with a partner or small group. Now share the question you selected.

If participants are new to these sorts of discussions, you may want to review the following concepts:

- When you are sharing your responses, provide reasoning and evidence. Reasoning is your own thinking behind your answer. Evidence is facts that support your answer, such as historical facts or scientific facts. You may also have experiences from your own life that support your answer.
- When listening to your classmates, ask questions. The purpose of questions is to better understand their thought process, not to challenge them. Some ways to frame questions are: “I didn’t understand X.” “Could you explain Y again?” “What do you mean by Z?”
- If someone asks you questions, provide clarification. Explain your reasoning and evidence. Remember that there are no right or wrong answers.

Watch the segment (10 minutes)

Think/write time (5 minutes): Participants write down their answers

Share with a partner (10 minutes): Pair up participants. Each person has 5 minutes to share their response and answer questions from their partner. Then switch so each partner gets a turn.

(Optional) Small groups (10 minutes): Put participants in groups of 4 for share-outs and conversations.

(Optional) Homework prompts: Expand your response into a report, picture, poem, essay, short story, song, or performance. Or, write your own discussion question for the group.