



Invisible Influence:

Unveiling the Mystery of Dark Matter

Dr. B explores the profound cosmic mystery of dark matter. What have we learned about it, and how do we even know it's there?



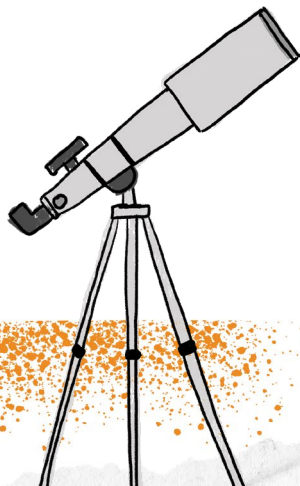
Watch the show!



<https://www.youtube.com/watch?v=KIXv0ELxTmo>

Quick Questions

1. Have you heard of dark matter?
2. Can you think of any scientific discoveries throughout history that involved finding things that were not detectable by the five human senses?
3. 15% of the matter in the universe is "normal" matter - the stuff we can identify. Does this number surprise you? Does 15% seem like a lot or a little?



Deep Dives

1. Why do you think scientists are interested in exploring the nature and purpose of dark matter? Do you think it's important for humans to understand dark matter? What benefits can you think of? What concerns might you have?
2. Scientists were able to discover dark matter despite not being able to detect it with any of their senses or current technology. Imagine a sealed box: you cannot see, hear, or smell anything inside of it. What steps would you take to try and figure out what is in the box? What tools might you try to use or build to study it?
3. We often build new tools to study things we cannot detect. For example, telescopes allow us to see things too far away to detect with our eyes alone. Radio telescopes and infrared telescopes allow us to visualize things that we cannot see with visible light—you need other wavelengths of light to see them. What do you think the next new telescope will allow us to do? Why?
4. In addition to dark matter, there are other things we cannot detect with our body's senses, unassisted by technology. However, we can observe their effects. For example, we cannot feel bacteria or see gravity, but we know they exist because we experience their effects. Can you think of something else that we cannot detect with our senses, but we experience its effects? Explain.
5. The discovery of dark matter was a huge surprise to scientists because we didn't have the tools to identify it. What do you think could be the next huge scientific discovery that wasn't previously possible due to limitations in our technology?
6. Think of technologies that have come out in the past 5 to 10 years. What do you think these technologies may help us to discover next?

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.