The Universe

The Universe is vast and full of mystery. Choose one of the following questions to pursue and share your findings with the class. You will have 25 minutes to research and create a quick draft of 1 - 3 slides and then 15 minutes to practice with another person and refine your presentation. We will start hearing presentations in random order right at the start of our next class.

Define our universe:

1. What is the shape of the universe? What are the options and how do we know what it is?
   Astronomy Mag article video video2
2. What is the color of the universe? How was that determined? Why don't we see that?
   NPR article video
3. What is the known size of the universe? How is it measured?
   SciAm article video
4. How much of the universe can we see? How will that change over time?
   Astro Mag article video
5. What is time? How is it linked to the formation of the universe?
   transcript of an interview video video2

Current mysteries:

6. How do galactic rotation curves provide evidence for Dark Matter?
   Research paper (from undergraduates!) Textbook overview video
7. How does gravitational lensing provide evidence for Dark Matter?
   NASA article video
8. How does the Bullet Cluster provide direct evidence for Dark Matter?
   NASA article video
9. What is the evidence in the cosmic microwave background radiation for Dark Matter?
   NASA article video
10. How was Dark Energy found using supernovae?
    article video video2
11. How does the cosmic microwave background provide evidence for Dark Energy?
    article video
12. How does Dark Energy explain the seemingly flat universe? - ziona
    article
13. How could Dark Energy change with time? Is there evidence that that it did change or will change?
    video May 2025 update video
14. What is quintessence and how does it attempt to explain Dark Energy?
    science paper video
15. What is the antimatter problem?
    CERN article video

Cutting edge engineering:

16. How will we reach stars that are so far from Earth? Create a swarm!
    NASA swarm brief video detailed video
17. How will we move machinery around on the Moon? Create a rail system!
    NASA levitate
18. How will we send humans on long space missions? Hibernation! (let's try it on animals first)
    article
19. How do we make sure we have precise measurements as we move around our Solar System?
    article

Cutting edge theory:

20. What is string theory? Why is this type of explanation needed? How many dimensions does it predict?
    article video
21. What is loop quantum gravity? Why is this type of explanation needed?
    paper video
22. What is the simulation universe hypothesis?
    Wired article video
23. What is the many worlds interpretation of quantum mechanics?
    article brief video longer video

Research the answer to your question. Create 2-3 slides to explain the answers you find, plan to talk for 1 minute - not less than 50 seconds and not more than 70. Slides should include the websites where you found images/information or the prompts you used to ask AI - put those urls in the Notes section of *each* slide.

Share your slides and practice your short presentation with the people at your table - everyone should listen to each other and offer constructive advice.

Update your slides and presentation based on the feedback your table shares with you.

Once you're done, find another topic that no one at your table is working on and do a little bit of research so that you have a few thoughtful questions you can ask. Be prepared to answer questions when you share with the class.

Your presentation should show that you did research on this topic and learned something about it that you did not know before. Plan to speak to the class for no longer than 1 minute and with no more than 3 slides.