

Sample discussion topics by class

Numbers refer to the number of the lecture.

1. How would you formulate a law of gravity?
2. Why did the scientific revolution not occur elsewhere? China? Ancient Greece? Muslim world? Mesoamerica? What roles did religion play, pro and con, in various places?
3. How important is mathematics in chemistry and biology? Is it amazing that mathematical modeling works so well in the physical sciences? How did Newton's accomplishments change our philosophy?
4. Can we ever declare a theory true? If not, how do you think this reflects on the utility of science? Could there be arbitrary freedom in future theories?
5. Must science be common sense? What role should everyday experience play in scientific models? How can this be communicated to people who do have different intuition/experience? There will also be discussions of famous special relativity paradoxes.
6. How has GR, or quantum mechanics, changed our overall philosophy? Should it? As we will see later, evidence for GR in its most extreme manifestations is very meager. How much should we believe it? Should aesthetic attraction play a role?
7. Midterm
8. Some current theories (e.g., superstrings) imply lots of other wild things, e.g., many extra dimensions. How much should we believe this? Is the cosmos infinite?
9. Does the existence of matter not found on Earth change our philosophical stance, e.g., in terms of the unity of the heavens and the Earth that had been the standard since Newton? How might we be convinced that a particular object is a white dwarf or a neutron star instead of a normal star?
10. Is Hawking radiation important? What will be the far future of the universe?
11. What is the role of prior assumptions in acceptance of explanations? How much evidence would be required to convince you of something you disbelieve very strongly? What are common misconceptions about black holes?
12. What would the universe, galaxies, and life be if there were no black holes?
13. How convincing is current indirect evidence for gravitational waves? What are some time travel paradoxes, and possible ways around them? What are the capabilities of an arbitrarily advanced civilization that still obeys the laws of physics?

14. Class presentations