



Study Questions for *Einstein's Messengers*

The following short-answer questions relate to issues that are discussed in *Einstein's Messengers*. Many of these questions will have more than one good answer. Several will ask for your opinion.

1. True or false: Humans have held the same basic idea of gravity for hundreds of years. Explain your choice.
2. Describe Newton's concept of gravity. How did Einstein's ideas about gravity differ from Newton's?
3. Describe a difference and a similarity between gravitational waves and water waves.
4. What's the name of the instrument that LIGO uses to detect gravitational waves? Draw a simple diagram of one of these instruments.
5. Why is technology important in LIGO? In your opinion, is LIGO a science project, an engineering project or both? Explain your choice.
6. The movie shows a number of computer simulations (models) of events that happen in space. How will scientists decide if these models are accurate?
7. How many people work on LIGO, approximately? Why might such a large number of people be necessary?
8. Why is it important for a scientist to be curious?

Open-ended questions

1. Many people think they know what a 'typical' scientist looks like (white lab coat, thick glasses, funny hair, etc.). Do you think that the LIGO scientists in the film fit this description? What, in your opinion, would be some important characteristics of scientists if not their appearance? What makes a scientist a scientist?
2. Imagine that you are working for LIGO. You and your fellow scientists think that you have finally detected gravitational waves directly. No one has ever done this before. What would you do to build confidence in your result? How would you answer those who might say, "No, the signal you measured was probably a truck driving by, or an airplane flying overhead, or a small earthquake"?
3. LIGO scientists work at institutions all over the world. Would you enjoy working with a group of hundreds of people that are spread out in this fashion? What would be some of the challenges of working with a group this large? What would be some of the potential benefits?
4. LIGO's quest to measure gravitational waves is an example of basic science research. Basic research projects are designed to question, discover and explore nature's fundamental behaviors. Do you feel that basic science projects such as LIGO are important? Is there value in learning about the universe? Share your thoughts.