

GRAVITATIONAL WAVES WITH THE GrEAT NETWORK

TALKING POINTS

1. When was the Theory of General Relativity published in its final form? (See the first part of the article)
2. Name one example of astronomical phenomena that was predicted by general relativity. (See the first part of the article)
3. Do all moving masses emit gravitational waves? (See *Where do gravitational waves come from?*)
4. Can you give two examples of technologies and instrumentation that have come about as a result of research into gravitational waves? (See *What practical outcomes could research into gravitational waves have for society and/or industry?*)
5. Name something that gravitational waves have been used to observe. (See *Why are gravitational waves of interest to researchers?*)
6. Which collaboration made the first ever direct gravitational-wave observation? (See the first part of the article)
7. What is gravitational attraction the result of? (See the first part of the article)

ACTIVITIES YOU CAN DO AT HOME OR IN THE CLASSROOM

The LIGO Scientific Collaboration has a wide range of activities for students on their website. Below are two examples, but we encourage you to take a look at the whole site – it really is amazing fun!

See <https://www.ligo.org/students.php>

BLACK HOLE HUNTER

The vibrations that can be detected by the LIGO gravitational-wave detector can be turned into a sound, allowing people to hear black hole collisions. However, other things can produce vibrations in the detector, such as an earthquake on the other side of the world or traffic a few miles away. These phenomena create noise in the detectors, making it harder to hear the gravitational-wave signal. In Black Hole Hunter, your objective is to listen to gravitational-wave detector data and determine whether or not you can hear the given gravitational-wave signal in the sound file, or whether it is just noise. Have a go and see if you can hear the sound track of the universe.

SPACE TIME QUEST

Space Time Quest is a fun game developed by gravitational-wave scientists working in the LIGO collaboration. The game puts you in charge of designing your own gravitational-wave detector. You make choices and trade-off decisions to select the best technology, while keeping an eye on the budget.

The game is casual but addictive: you can reach the first score (how many gravitational waves did you detect?) in just a few minutes. But then you want to go back and try for the highest score, knowing that LIGO scientists are also in the gravitational-wave high-score hall of fame. Can you beat them at their own game?

AND HERE ARE THREE MORE SUGGESTIONS!

1. Take an interactive virtual tour of LIGO's facilities from the comfort of your classroom or home.
2. Play the Black Hole Pong Game, which uses black holes to gravitationally move and sling a mass into your opponent's half of the screen.
3. Operate LIGO by taking the controls of a virtual gravitational-wave interferometer.