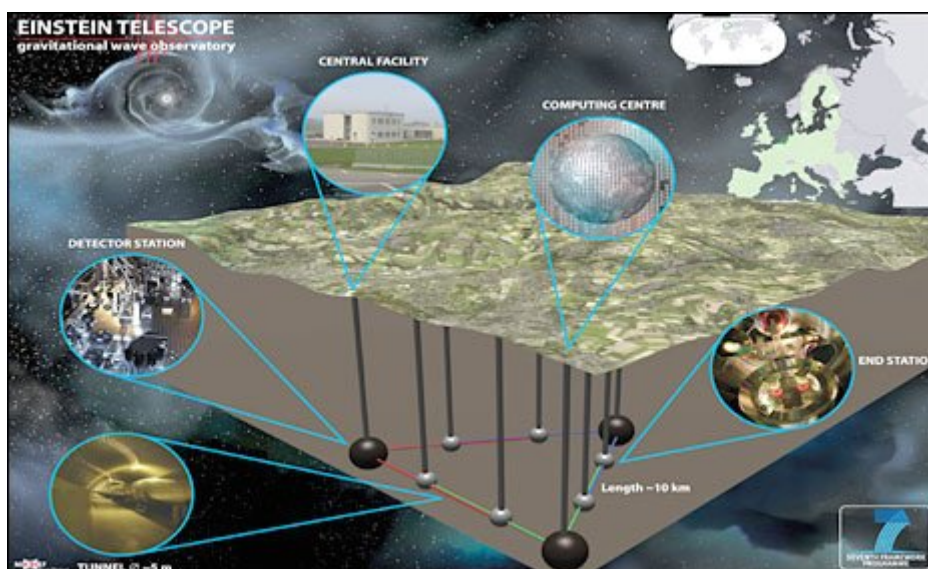


Name:

Read this article about the origin of the universe and answer the questions

The universe and how it began...



Scientists in Cardiff are working on what the Einstein Telescope will be able to do. *Graphic courtesy of Cardiff University*

Scientists in Wales are hoping their research will help reveal information about the origins of the universe.

Professor Bangalore Sathyaprakash of Cardiff University said he and his team were in the early stages of work which could help unlock its secrets. The physicists are part of the Einstein Telescope project, which has just received 3m euros for its design stage.

It is the first stage of European research that could be as significant as the Big Bang experiment in Geneva.

Prof Sathyaprakash, from the university's school of physics and astronomy, said the work would lead to the building of "a third-generation gravitational wave observatory" which would help scientists gain a better understanding of the universe.

Gravitational waves are triggered by the movement of massive objects in space, such as the collision of stars and the vibrations from black holes.

The waves were predicted in 1916 by Albert Einstein as part of his theory of general relativity, but have not yet been detected directly.

"I think it's going to be very exciting for both Cardiff and our own group here," he said.

"It's at the cutting edge. It's at the forefront of physics research.

"When built, the underground detector would be comparable to Cern (the European Organization for Nuclear Research) in size and the quality of science it promises to deliver, although the cost is probably much smaller since our tunnels will be empty except for a powerful laser going up and down."

The Large Hadron Collider on the Swiss-French border is re-creating conditions just after the Big Bang in an attempt to answer fundamental questions of science and the universe itself.

The collider is currently shut off until next year while engineers investigate a magnet failure.

Professor Sathyaprakash said his "dream" was to create a "Cern-like facility for gravitational radiation".

He is leading the design study to decide exactly what the Einstein Telescope will be able to do and how it will be set up.

"The ultimate goal of any gravitational wave detector or telescope is to look at the birth of the universe," he said.

Black Holes

"In five to seven years I think we will be big news when current detectors will be upgraded to 10 times better sensitivity than they are today to advanced detectors, and make the first direct detection of gravitational waves.

"Einstein Telescope will go beyond the advanced detectors and should help us understand the origins of the universe and its workings far better than we are able to do today."

Prof Sathyaprakash said the research would also help reveal information about ultra-dense nuclear matter, the warping of space and time close to Black Holes and gamma ray bursts.

The team at Cardiff has received a 300,000 euros share of the 3m euros to work on this first stage.

Other research institutes from England, Scotland, Germany, Italy, Holland and France are involved in the project.

The design study will take three years and scientists hope the Einstein Telescope will be ready some time about 2020.

Questions

1. Describe briefly the theory of Big Bang. Use the concept of "singularity" in your description

2. Place the solar system in the universe by filling the spaces below:

- Our galaxy is:
- Our arm of the galaxy is:
- Alpha-Centauri is:

3. Describe briefly the issue (problem) of Earth's magnetic field inversion today

4. Describe the following characteristics about gravitational waves:

- they were proposed by:
- they have been detected (true/false):
- their detection will be used in the explanation of:
- the scope of the project involved is (national/international):

5. Link the LHC experiment and black holes