

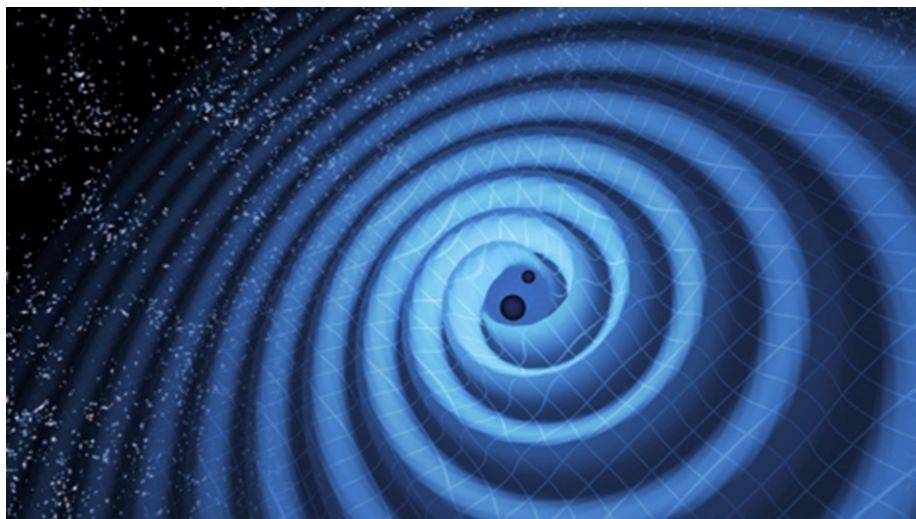
## Gravitational wave cosmology

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The first direct detection of gravitational waves was made by LIGO observatory in 2015. These waves were produced by the collision of two black holes, and therefore allow us to probe one of the most exotic and gravitationally extreme environments in the Universe. Gravitational wave events are now being detected regularly, and we are just at the beginning of understanding what they can reveal about the nature of gravity. Particularly powerful in this regard are the subset of events known as 'Standard Sirens', which are detected through both gravitational and electromagnetic waves. Standard Sirens are particularly relevant for cosmology, as they allow us to measure its rate of expansion as a function of distance.

During this project, the PhD student will investigate what gravitational waves might hold in store for cosmology. This could include:

- Studying the effect of dark energy on the gravitational waves signals that are emitted from inspiralling massive bodies.
- Determining how well we will be able to test cosmological models using Standard Sirens, as opposed to standard candles.
- Studying whether and how we can use gravitational wave events *without* electromagnetic counterparts.
- Calculating the distortion effects of gravitational lensing on gravitational waves, as they pass through the Universe.



*Note: This project description can be used for the "Research Proposal" part of your application.*