

## Astronomy Talk 13<sup>th</sup> February 2024

### Gravitational Wave Astronomy

Prof. Nils Andersson from Southampton University came to BNSS to give this lecture. It was a hybrid with Zoom as well. 20 attended in the hall, and 66 online.

Nils started by looking at Einstein's General Relativity theory (GR), and its explanation of Mercury's precession. Basically, matter bends space and time, and can also make waves, especially when 2 bodies crash together. Karl Schwartzchild was the first to postulate Black Holes per GR in 1916, though Einstein wasn't sure they could exist.

We then looked at small black holes and huge ones, and the field got stuck there till the mid-1950s, when the first attempts were made to detect the stretching and squeezing of space by gravitational waves.

The effect is very small, so for example the LIGO detector is looking for a change of  $1/1000$  of the radius of a nucleus in its 4 km arms, using interferometry. Many detections have now been made, all of which are a few solar mass events as it isn't sensitive enough to pick up more massive ones that make waves at longer wavelengths.

Nils then talked about colliding neutron stars and the elements they can make, e.g. gold, and at radio pulsars whose timing is so precise they can be used to measure waves that stretch or squeeze space.

Lastly, he talked about the ESO proposed LISA space antenna with arm lengths of 1 million km, which could detect effects from 1 million solar masses colliding, to be launched in the next decade.

Many questions, and an excellently clear lecture.