

The Gravitational Universe

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Lecture 1 - *Spacetime Vibrations from the Universe*

- Heritage
- Gravitational Waves (GWs) in a nutshell
- The beauty, simplicity, and universality of the GW signal from merging black holes
- What have the LIGO-Virgo-KAGRA interferometers revealed about stellar-mass black holes?
- Filling the Mass-Gaps: a new storytelling on massive stars?

Lecture 2 - *Massive black holes in the Gravitational Universe*

- Is there a bridge between stellar-mass and supermassive black holes?
- An interferometer in space - LISA: GW signals from merging massive black holes
- Measuring masses and spins to uncover the growth of supermassive black holes during the assembly of galaxies
- Do merging massive binary black holes emit light as AGN do?
- Challenges and unknowns

Lecture 3 - *Pairing black holes down to the smallest scales*

- Massive black hole binaries: dynamics - time delays - rates
- Extreme Mass Ratio Inspirals - invisible galactic centres unveiled
- The deep link between LISA and III Generation Ground Based interferometers: piercing deep into the cosmic dawn