Contribution ID: **81** Type: **not specified**

# Non-linearities in black hole perturbation theory

*Friday, 11 July 2025 11:10 (20 minutes)*

In this talk, I will discuss recent progress in understanding non-linear tidal responses and gravitational-wave tails in black hole perturbation theory. In the first part, I will present new findings demonstrating that GR black holes possess an infinite number of vanishing non-linear tidal Love numbers. These results are derived systematically using a worldline effective field theory framework, revealing deeper symmetry structures that constrain black hole tidal responses beyond the linear regime. In the second part, I will discuss the generation of gravitational-wave tails arising from non-linear perturbations during the ringdown phase. Remarkably, they decay more slowly than the well-known linear Price tails, indicating that at late times, non-linear effects dominate the gravitational-wave signal. Implications for gravitational-wave observations and theoretical modeling of black hole mergers will be highlighted.

**Presenter:** WONG, Sam (CUHK)

**Session Classification:** Parallel 1