



北京師範大學物理與天文學院

SCHOOL OF PHYSICS AND ASTRONOMY, BEIJING NORMAL UNIVERSITY

題目: From cosmology to black Holes:
Scalar-Tensor theories and weak
solutions

報告人: Dr. Hongguang Liu, Westlake Univ.

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報告人簡介:

Hongguang Liu received his Bachelor's degree from Beijing Normal University in 2015, and subsequently earned the Master's degree at Aix-Marseille University in 2016. He then completed his doctoral studies in Theoretical and Mathematical Physics at Aix-Marseille University and the APC Laboratory (Astroparticles and Cosmology) of Paris Cité University in 2020. After conducting postdoctoral research at Friedrich-Alexander University Erlangen-Nürnberg (FAU) in Germany from 2020 to 2024, he joined the Institute for Theoretical Sciences at Westlake University in February 2025 as an Assistant Professor. His research interests include quantum gravity and related topics including quantum information, black hole and cosmology.

報告摘要:

Regular black holes play a pivotal role in understanding effective dynamics arising from quantum gravity. In this talk, I will present a series of scalar-tensor theories that allow us to lift cosmological solutions to their spherically symmetric counterparts, explicitly constructing dynamical spherically symmetric solutions that include inhomogeneous collapse. I will discuss their connections to canonical formulations of quantum gravity, particularly how to reconcile with covariant effective theories and the connection with asymptotic safe theories. I will then explain how this approach resolves ambiguities in interpreting quantum-gravity-inspired dynamics and clarifies the relationship between cosmological and black hole solutions under symmetry reduction, with examples including bouncing cosmology and Hayward-like dynamics. Moreover, I will discuss the appearance of weak solutions and shock waves in these models and their significance.