THE UNIVERSITY OF HONG KONG

DEPARTMENT OF PHYSICS
SEMINAR

The Earliest Massive Structures in the Universe

Dr. Qiong LI

University of Manchester

Abstract:

JWST has transformed our view of the early Universe, revealing complex structures and active supermassive black holes much earlier than previously thought. I will present recent results from JWST programs that probe galaxy overdensities and protoclusters at z=4–10 through deep spectroscopy and multi-wavelength imaging, complemented by X-ray observations. These results show that environmental effects, mergers, and feedback were already shaping galaxy growth and AGN activity within the first billion years. Highlights include the discovery of a dual AGN system at z∼5.4 embedded in a Lyα-emitting nebula within a forming galaxy cluster, and the detection of diffuse X-ray emission in a massive protocluster at z∼5.5, offering the first direct evidence of early virialisation at cosmic dawn. To place these results in a broader context, I will also present complementary studies of dusty quasar environments and large-scale structures traced by submillimetre and radio observations, as well as investigations of extended Lyα nebulae that probe the multi-phase circumgalactic medium in dense regions. Taken together, these results suggest that the seeds of today's massive clusters were already taking shape at cosmic dawn, and offer a more unified picture of how galaxies, black holes, and gas co-evolve in the most massive environments.

Biography:

Dr. Qiong Li is currently a research associate at the University of Manchester. She received her PhD from Peking University in 2020. Her research focuses on the formation of the earliest galaxies and massive structures in the Universe. She works primarily with observational data, combining JWST with multi-wavelength observations from other major facilities. She is a core member of several major international collaborations, including JWST EPOCHS and PEARLS, and is also a member of the Euclid Consortium and the ELT/MOSAIC Science Working Group. She has published over 50 papers, with 12 as first or corresponding author, in leading journals including Nature, Science, MNRAS, and ApJ.

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