

**Z104a New insights into the environmental dependence of massive galaxy formation from a panchromatic view of the first galaxy clusters**

Tao Wang (University of Tokyo/NAOJ)

The role of local environment in massive galaxy formation remains debated. While it has been known that massive ellipticals are preferentially located in dense environments, the early assembly of these galaxies makes it difficult to explore what is the role of environment during their formation/quenching. Here we combine multiwavelength observations with Subaru, VLT, HST, Keck, VLA, and ALMA towards the most distant known X-ray cluster at  $z = 2.51$ , to reveal a key formation phase of massive clusters, in which clear evidence of environmental dependence on galaxy star formation and gas properties has been observed. These studies also show the power of combining multiwavelength observations in revealing the true 3-D structures of galaxy clusters in the early universe.