



## Host galaxies of quasars in the early universe revealed by JWST

### 丁旭恒 (武汉大学)

Ding Xuheng is currently a faculty at Wuhan University. He uses advanced observational data to conduct research on related issues in the fields of galaxy evolution, strong gravitational lensing, and multi-messenger astronomy. He served as the PI of NASA's international observation program and processed observational data from the James Webb Space Telescope (JWST) and the Hubble Space Telescope (HST). The work he led detected the starlight of quasar host galaxies in the early universe ( $z > 6$ ) for the first time, providing observational basis for exploring the growth of supermassive black holes in the early universe, which was selected as one of the most important discoveries of JWST in 2023.



### Abstract

In the first billion years of the universe, supermassive black holes shone brightly in the form of quasars, which posed a puzzle to the field of astrophysics. Scientists need to propose reasonable physical mechanisms to explain how these supermassive black holes in the early universe formed and grew rapidly. Studying the relative evolution relationship between black holes and their host galaxies is considered an important means to solve the mystery. However, due to the cosmological effect, even with deep observations using the Hubble Space Telescope, it is almost impossible to detect stars in quasar host galaxies with redshifts greater than 3. In this report, I will share my observation experience using the James Webb Space Telescope (JWST), and for the first time used this device to detect two quasar host galaxies with redshifts greater than 6, and successfully measured their stellar masses. By comparing with the mass of the central supermassive black hole, I will introduce how their relative mass relationship evolved in the early universe.

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