

The seeds of the first supermassive black holes

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Quasars powered by supermassive black holes of 10^{10} solar masses already existed at $z \sim 6-7$, when the Universe was less than 1 Gyr old. Recently, the James Webb Space Telescope has started to detect supermassive black holes of 10^7 at even $z \sim 10$. To reach this mass in such a short time, supermassive black holes should have started as seed black holes of 10^2-10^5 solar masses at $z > 15$. Such seed black holes could result from the death of the first generation of Population III stars or form either via runaway mergers in dense stellar clusters or via direct collapse of pristine gas, among other possibilities. While those seed black holes that did not grow could be found as leftover intermediate-mass black holes in globular clusters and dwarf galaxies in the local Universe, the detection of the early seeds will have to await the next generation of observatories such as the Einstein Telescope.

Presenter(s) : Dr MEZCUA, Mar (Institute of Space Sciences)