

Grow Supermassive Black Holes in the Early Universe

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Quasars are active nuclei of galaxies powered by accretion onto their central supermassive black holes. They have been discovered at a redshift up to 7.5, only 700 million years after the big bang, and provide ideal probes to the formation and evolution of the earliest supermassive black holes in the universe, and to how the universe was transformed through cosmic reionization at the end of cosmic dark ages. New generations of wide area sky surveys, including SDSS and DES, enable systematic searches of these earliest quasars. Recent discoveries of quasars with central black hole masses up to ten billion solar masses in the early universe indicate extremely rapid growth of black holes at early epoch, challenging standard model of black hole formation through collapse of young massive stars, and suggest initial seeding of supermassive black holes through direct collapse of pristine gas with >1000 solar masses.