

Black holes in the Early Universe

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The existence of supermassive black holes (SMBHs) of $\sim 10^9$ solar masses in quasars at $z \sim 7.5$, when the Universe was ~ 700 Myr old, is an intriguing puzzle and their origin remains unconstrained. It has been proposed that those SMBHs result from rapidly growing BH seeds of stellar and/or intermediate masses BHs at redshifts $z \sim 30$. However, there is no consensus on whether such extreme rapid mass growth of BHs may be sustainable during the required 600 hundred million years. Direct detections in the mid-infrared of massive BHs in galaxies at $z = 7$ to 15 with the JWST, and indirect detections of radio loud BH signals in the redshifted 21cm line of HI at $z \sim 20$ with radio arrays as SKA, may constrain the ultimate origin of the SMBHs observed up to $z \sim 7.5$. In this talk, I would discuss these issues along the lines of a review accepted for publication in *New Astronomy Reviews*, and posted in <http://arxiv.org/abs/2203.12741>

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