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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 because 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 600 hundred million years since the Big Bang. Direct detections in the near and mid-infrared of galaxies and massive BHs at $z = 7$ to 16 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 will discuss these issues along the lines of a review of open access published in *New Astronomy Reviews* 94, 101642 (2022).

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