BLACK HOLES IN DENSE STAR CLUSTERS
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TITLE: Rapid Black Hole Formation in the Early Universe

SPEAKER: Tal Alexander (Weizmann Institute of Science, Israel)

Mass accretion by black holes (BHs) is typically capped at the Eddington rate, when radiation's push balances gravity's pull. However, even exponential growth at the Eddington-limited e-folding time t_E ~ few * 0.01 billion years is too slow to grow stellar-mass BH seeds into the supermassive luminous quasars that are observed when the universe is 1 billion years old. We propose a dynamical mechanism that can trigger supra-exponential accretion in the early universe, when a BH seed is bound in a star cluster fed by the ubiquitous dense cold gas flows. The high gas opacity traps the accretion radiation, while the low-mass BH's random motions suppress the formation of a slowly draining accretion disk. Supra-exponential growth can thus explain the puzzling emergence of supermassive BHs that power luminous quasars so soon after the Big Bang.