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Quantum Simulators for Fundamental Physics

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Exploring the dynamics of the early universe and black holes unveils profound insights into the interplay between general relativity and quantum fields. Important phenomena emerge when gravitational and/or field interactions are strong, and/or when quantum effects become prominent. Notable examples include Hawking's proposal on the evaporation of black holes, Penrose's conjecture on the spin-down of rotating black holes, and Kofman's proposal on particle production during preheating. Despite their significance, observing these phenomena directly remains elusive. In this presentation, I will report on recent advancements in investigating rotating black hole processes in laboratory experiments quantum liquids.

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