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Toward First-Principles Quantum Simulations of Heavy-Ion Collisions SCOTT LAWRENCE, University of Colorado Boulder, NUQS COLLABORATION — First-principles lattice QCD simulations are unable to study much of the heavy-ion collision process due to the sign problem associated to real-time calculations. The advent of (small-scale, noisy) quantum computers provides a possible way around this: quantum computers are most naturally able to study precisely those real-time processes that are most difficult for the Euclidean lattice. A quantum simulation of an entire heavy-ion collision, however, is prohibitively expensive. Long before simulations of an entire heavy-ion process become accessible, we face the possibility of studying certain parts in isolation. In particular, the fluid dynamics of the quark-gluon plasma near equilibrium (e.g. viscosity), and the real-time dynamics of hadronization, are promising targets for early quantum simulations of lattice QCD. This talk outlines recent progress toward practical simulations of QCD on a quantum computer.

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