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Abstract for an Invited Paper  
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**Quantum Simulator Package (QuSP): A Robust and Flexible Integrated Modeling Environment for  
Entangled Quantum Dynamics**  
LINCOLN CARR, Colorado School of Mines

Abstract: The popular press has presented exciting near-term possibilities for building digital quantum computers based on qubits, quantum gates and quantum circuits that out compute any classical computer. However, there are in fact already several hundred working analog quantum computers based on time-evolving many-body quantum states under Hamiltonians in continuous time. Many of these computational platforms are built on decades of experimental and theoretical advances in atomic, molecular, and optical physics, and can be viewed as high precision many-body experiments. For instance, the 2003 discovery of the unitary quantum gas corrected 50 years of many-body quantum theory on the fundamental question of how fermions pair to make bosons. Classical computers have continued to play a role in pushing forward these experiments, both in experimental design and in determining the limits of classical computation to model quantum dynamical phenomena, such as entanglement in many-body quantum chaos and the continuous-time generalization of quantum cellular automata. In this talk, I will present our open source quantum simulator package (QuSP), which runs on classical computers such as a laptop or high-performance computing cluster. QuSP has been downloaded over 3000 times and is used in many labs and research groups worldwide. Recently, together with the Science Gateways Community Institute (SGCI), we have built an even more accessible interface, a browser-based science gateway. Thus, whether computationally experienced scientists or just beginning to acquire key life skills in computation, both experimental and theoretical students will leave this graduate student symposium with a new set of tools they can use in their research on quantum simulators, aka analog quantum computers.

Symposium participants are encouraged to bring their laptops and to download and install QuSP prior to the symposium.