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Novel quantum transport in superconducting phase-qubit arrays. FREDERICK STRAUCH, National Institute of Standards and Technology — The dramatic increase of coherence times in superconducting phase qubit experiments allows the exploration of multi-qubit quantum dynamics. In this talk I theoretically explore the controlled propagation of excitations in capacitively-coupled phase qubits. By exploiting the tunability and flexible topology of phase-qubit arrays, this artificial solid can demonstrate novel quantum transport effects such as perfect state transfer. These ideas are confirmed by multi-qubit, multi-level simulations including the effects of long-range couplings, disorder, and decoherence.

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