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**Symmetry-Protected Quantum Adiabatic Transistors** DOMINIC J. WILLIAMSON, University of Vienna, University of Sydney, STEPHEN D. BARTLETT, University of Sydney — An essential development in the history of computing was the invention of the transistor as it allowed logic circuits to be implemented in a robust and modular way. The physical characteristics of semiconductor materials were the key to building these devices. We aim to present an analogous development for quantum computing by showing that quantum adiabatic transistors (as defined by Flammia et al.) are built upon the essential qualities of symmetry-protected (SP) quantum ordered phases in one dimension. Flammia et al. and Renes et al. have demonstrated schemes for universal adiabatic quantum computation using quantum adiabatic transistors described by interacting spin chain models with specifically chosen Hamiltonian terms. We show that these models can be understood as specific examples of the generic situation in which all SP phases lead to quantum computation on encoded edge degrees of freedom by adiabatically traversing a symmetric phase transition into a trivial symmetric phase. This point of view is advantageous as it allows us to readily see that the computational properties of a quantum adiabatic transistor arise from a phase of matter rather than due to carefully tuned interactions.

Dominic Williamson
University of Vienna

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