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Abstract for an Invited Paper
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Building Robust Qubits¹

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In 1994, Peter Shor discovered that quantum computers could efficiently factor whole numbers, a task for which there is no known classical algorithm and whose difficulty is at the heart of modern public key cryptosystems. This amazing theoretical result, however, is mostly for naught if we cannot build a large scale quantum computer. In this talk I will discuss the difficulties in building a quantum computer and why we are confident that a large scale quantum computer can be built. In particular I will discuss the threshold theorem for fault-tolerant quantum computation and then describe recent work which seeks to implement the ideas of fault-tolerant quantum computation in many-body strongly interacting quantum systems. Such self-correcting quantum computers have the potential to jumpstart an age of quantum information devices.

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