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Long live the quantum revolution!

It is the consensus that we are witnessing the dawn of the second quantum revolution. It is the coveted prize of politicians, entrepreneurs and scientists alike. But will it live up to the great hopes it arouses? I am of the mind that we better tone down our expectations, but there are aspects of the anticipated revolution that we should promote forcefully.

Here is my perspective of it:

- Quantum computing: The excessive reliance on ancillae for error correction is becoming a liability. More resources should be committed to dynamical control of decoherence, which has been almost untapped despite its promise. Notwithstanding, quantum computing may fall short of expectations.

- Quantum teleportation: Here, on the contrary, much more should have been done. Existing teleportation of photons to other photons does not serve a truly useful purpose. Instead, we should target teleportation of matter, e.g. molecules, via light [2] with the view of developing it into a novel method of hardware shipment without transporting it.

- Quantum entanglement distribution: Existing protocols are probabilistic and hence not fully reliable. Yet there are deterministic mechanisms mediated by long-range interactions that show promise[3].

- Quantum sensing: This is a promising direction, not only for physical but also for biomedical applications. MRI and NMR can be much improved by dynamical control of the probe [4] and by radically enhanced sample cooling.

- Quantum thermodynamic machines: Interest is growing in this field, but usually quantum machines are no better than classical ones. Still, quantum machines may achieve power boost ("quantum supremacy"), particularly via cooperativity of many atoms.

In view of the above, let us not lose our heads over the quantum revolution and recall that revolutions are often followed by counter-revolutions (or, plainly, backfire).

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