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Editorial

Gerard Milburn*

*Correspondence:
milburn@physics.uq.edu.au
University of Queensland, St Lucia, Australia

Editorial

Driven by advances in technology and experimental capability, the last decade has seen the emergence of quantum technology: a new praxis for controlling the quantum world. It is now possible to engineer complex, multi-component systems that merge the once distinct fields of quantum optics and condensed matter physics.

Engineered quantum systems often require complex processing of constituents at the nanoscale using diverse materials, and moving parts, and incorporating intra-system communication channels via optics or mesoscopic electronics. Improved fabrication techniques now make it possible to engineer supra-atomic scale structures that collectively obey quantum laws. The ability to prepare single quantum systems in an extremely well known initial state through techniques such as sideband cooling, feedback and conditional measurement on single systems, enable quantum control systems engineering.

Examples of engineered quantum systems that are already impacting technology include quantum logic clocks and manipulating quantum noise in laser interferometers for gravitational wave detection. New experimental techniques to mitigate the effect of noise and decoherence will find wide applicability in emerging quantum technologies such as sensors and clocks. Indeed this last application may see atomic and ion trap clocks appearing in consumer technology over the next decade.

Emerging quantum technologies will also enable new ways to simulate/emulate complex quantum systems by hardwiring engineered complex quantum systems to investigate new quantum phases of matter and provide access to theoretical investigations that are currently impossible.

Our world has been transformed by complex engineered systems for processing and communicating information. Very large experimental programs have been directed towards realising quantum versions of these systems, qubit processors, for more than a decade. However communication and computation systems are merely one application of the kind of novel engineered quantum systems that are now possible. Beyond qubits lies a new frontier of science and technology.

With the launch of *EPJ Quantum Technology* we aim to provide a new Open Access forum for researchers in these fields. Topical collections will feature regularly; the first papers published in the journal are part of a Thematic Series on *Microwave Quantum Optics*, and a series on *Quantum Simulations* is now open and will appear later this year.

We encourage regular submissions to the journal and welcome your support for this new venture in the field of quantum technology.

Gerard Milburn
Editor-in-Chief

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