A message from the Networked Quantum Information Technologies (NQIT) Hub Director

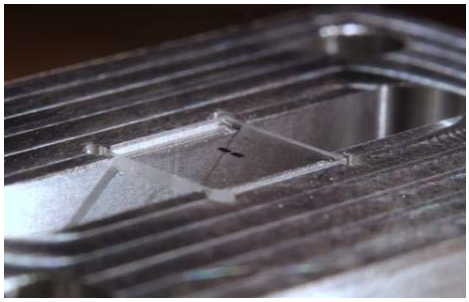
The NQIT Hub is part of the UK National Quantum Technology Programme, funded by the Engineering and Physical Sciences Research Council and led by the University of Oxford. It involves 29 globally leading quantum technology centres and major companies, all working together to realise an entirely new technology sector based on quantum mechanics.

The Hub's focus is on quantum systems that can connect together to form flexible, scalable solutions for quantum enhanced computing, advanced simulation, secure communications, and novel sensing technologies. These powerful principles of flexibility and scalability have caused the network to become the single most important concept in modern information technology, with incalculable beneficial impacts on society. A quantum network inherits these features, but because each subsystem contains a quantum core, the overall network can achieve things that are effectively impossible with conventional technologies.

I am excited to be leading this part of the UK's quantum technology programme and I am certain of its transformative potential. I hope that in the coming years you will see the benefits to UK society and its knowledge economy from our efforts, and I invite you to join us: research with us, invest with us or simply connect with us at www.NQIT.ox.ac.uk if you are curious to know more!

Professor Ian Walmsley
(Director, NQIT Hub)

Scientific Collaboration



Superconducting qubit in microwave cavity (photo credit: P.Leek)

We have already built small systems that store and manipulate quantum states and we have harnessed light as a quantum information carrier. We will now bring these together to deliver a suite of networked quantum information technologies. These systems included quantum computer designed to accelerate discoveries in science, engineering and medicine, as well as distributed sensors and multi-party 'hacker proof' communications over long distances (quantum key distribution).

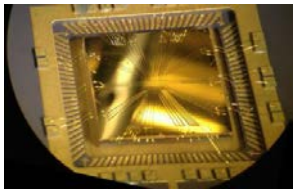
The Hub will foster the emerging quantum industry through not only our technology development, but also an international effort to define standards for compatibility between systems, and by training the next generation of quantum engineers.

The UK National Quantum Technologies Programme aims to ensure the successful transition of quantum technologies from laboratory to industry. The programme is delivered by EPSRC, Innovate UK, BIS, NPL, GCHQ and Dstl.

UK NATIONAL QUANTUM TECHNOLOGIES PROGRAMME

NQIT Applications

Quantum technologies will impact numerous activities that use information processing, ultimately making possible tasks that would be impractical by any other means.



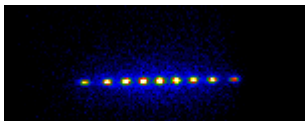
Ion trap chip for scalable microwave qubit addressing (D.Aude-Craik/D.Allcock)

Today, machine learning (or artificial intelligence) applications range from big data analysis, to prototype self-driving cars and even medical diagnostics. But the difficulty of these tasks may limit the capabilities of conventional computers; quantum information processors can enable deeper learning for neural networks and fundamentally superior predictive power. A related task is optimisation, whether it is maximising the efficiency of a supply chain or the balance of stocks in a portfolio. Here again conventional computers are powerful tools, but quantum processors are expected to reach unprecedented levels of performance leading to vital competitive advantages.

Meanwhile in industrial R&D, the search for next generation materials and chemicals involves painstaking laboratory trial-and-error, but quantum simulators will enable accurate prediction of new properties, thus accelerating discovery.

Today's cloud computing faces a conflict between the ever increasing demand for user data storage and processing, and rising concerns over personal privacy; quantum information protocols offer the prospect of finally reconciling these two priorities.

Outreach and engagement with users



Trapped-ion quantum memory register (photo-credit: D.Lucas/A.Steane

- User Forum (2 meetings a year)
  - Identifying new opportunities
  - Reporting the progress of our work to the community
  - Open to existing and potential partners from industry and academia

NQIT has resources for funding User Projects. These are collaborative projects between Industrial Users and NQIT researchers. The aim is to attract new and relevant industrial partners to help accelerate NQIT's progress and to exploit the full potential of the quantum technologies that are developed within NQIT. The Hub employs Technology Associates who are scientists with industrial research backgrounds, responsible for identifying opportunities arising both from the science in the hub and from commercial markets. They work with the industrialists and academics to formulate suitable User Projects. The User Engagement team will accelerate the development of new commercial activities.

- Skills Forum (2 meetings a year)
  - Support the student and researcher training programmes
  - Tutorial talks and other training activities.

Contact Us

For more information on how to take part in our collaborative projects visit
http://www.ngit.ox.ac.uk/user-engagement

For general information on the Hub visit www.NQIT.ox.ac.uk or e-mail:

Prof Ian Walmsley (Director)	ian.walmsley@physics.ox.ac.uk
Dr Tim Cook (Co-Director for User Engagement)	tim.cook@physics.ox.ac.uk
Prof Dominic O'Brien (Co-Director for Systems Engineering)	dominic.obrien@eng.ox.ac.uk
Prof Simon Benjamin (Associate Director for Partnerships)	simon.benjamin@materials.ox.ac.uk
Dr Iris Choi (Technology Associate)	iris.choi@physics.ox.ac.uk

The UK National Quantum Technologies Programme aims to ensure the successful transition of quantum technologies from laboratory to industry. The programme is delivered by EPSRC, Innovate UK, BIS, NPL, GCHQ and Dstl.

UK NATIONAL QUANTUM TECHNOLOGIES PROGRAMME