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Quantum Technologies

The quantum world is full of weird and wonderful phenomena, and harnessing these phenomena will open up a plethora of new technologies and capabilities. The quantum technology sector is trying to do just that. In this meeting we heard from three experts in this field who all guided us through this exciting topic. Dr Ilana Wisby is the CEO of Oxford Quantum Circuits, and she gave us a brief overview of some of the quantum phenomena which companies like hers are trying to use. Roger McKinlay, Challenge Director at Quantum Technologies UKRI, explained how the UK's National Quantum Technologies Programme is working to bring together scientific research and commercialisation for quantum technologies in the UK. Professor Sir Peter Knight is the Chair of the National Quantum Technologies Programme, and his talk focused on the current challenges within quantum technology, and how overcoming these challenges will open up incredible new technological capabilities as well as a rapidly growing new market. We had a wide ranging Q&A session at the end of the meeting, with some questions focusing on how to get more young people into this industry, and the potential threats quantum technology posses.

The application of quantum technologies represent a paradigm shift. Quantum computing not only has the potential to develop devices of vastly greater computing power than conventional computers, but also to develop devices that can solve problems which haven't been practically solvable before. Sensing quantum technology will provide more accuracy in our measurements, for example being able to use gravitational deviations to map the ground below a building project. There are many applications for these new technologies, and they have the potential to improve our capabilities massively within the next few decades.

The National Quantum Technologies Programme is a huge advantage to the UK in this field, and many countries around the world are looking towards it as a model for their own programmes. There are currently 40 live projects which cover innovation over a whole range of new technologies. The Programme funds research hubs in universities and requires that this research has the potential to produce commercial technologies. The universities pair up with private companies which then provide investment to further the project. The initial investment acts as a catalyst for private investment, and many projects quickly accumulate this investment; the 37 projects which have received £100 million from the NQTP have already raised over £100 million in private investment.

The quantum technology sector is expected to grow massively within the next few decades. In 10 years the global market is expected to be between $25 billion - $50 billion, and this is expected to rise to between $450 billion - $850 billion in 20 years from now. The UK is in a good position to harness this but we must continue to invest in innovation.

Despite the excitement for these new technologies, there are great challenges to overcome. Quantum coherence is what these technologies rely on, but this becomes exponentially more fragile as the system increases. This poses a major challenges for quantum computing. A device with only 300 qubits would have the capability of a supercomputer, but getting to this point and beyond we must create the technologies required for controlling this system. Investment is needed here, but UK companies also must be able to recruit young, newly qualified individuals who will help lead to further breakthroughs. To do this we must be able to offer competitive salaries, as well as encouraging young people go into this developing industry.

Challenges outside the technology also remain. The fear that quantum technologies will pose national security threats and the desire of governments for their country to benefit from this new industry is leading to premature quantum nationalism. We must continue to encourage international collaboration where possible. This also requires a continued high investment in this industry so the UK can remain a big player in quantum technology.

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