establish a larger consortium of repositories that harmonizes model characterization, distribution and database infrastructure (Fig. 1).

Stewart *et al.* have made a meaningful contribution to the modelling of cancer in general and to the modelling of paediatric solid tumours in particular. They provide one of the most comprehensively profiled repository of PDXs so far. The extensive data sets they generated will serve investigators around the world and, we hope, further drive a culture of generosity and sharing that benefits all. ■

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APPLIED PHYSICS

Quantum signals could soon span the globe

Quantum communication offers many advantages over classical methods, but it has been limited to sending signals across a few hundred kilometres. Two studies overcome this limitation. SEE ARTICLE P.43 & LETTER P.70

ELENI DIAMANTI

The quantum properties of light can be used for communicating in ways that are not possible in classical physics. For instance, they allow encrypted messages to be exchanged with absolute security and enable information about an object to be transferred without needing to send the object itself. In typical quantum communication channels — such as optical fibres — more and more photons are lost as the transmission distance increases, which severely limits how far an information transmitter and receiver can be from one another. On pages 43 and 70, respectively, Liao *et al.*[1] and Ren *et al.*[2] demonstrate quantum communication between an orbiting satellite and ground stations on Earth in which photon loss is minimized because the particles mostly travel through empty space. The authors have extended the communication distance achieved in previous studies[3,4] by hundreds of kilometres — a milestone towards bringing quantum communication to a global scale.

Quantum communication relies on encoding information in the properties of quantum particles and aims at transferring this information to a distant location and manipulating it to perform specific tasks[5]. Two such fundamental tasks, which cannot be achieved using classical information, are quantum key distribution (QKD) and quantum teleportation. In QKD, two parties share a string of bits called a key, which is known only to them and which they can use to encrypt and decrypt a secret message with absolute security. In quantum teleportation, the quantum state of a particle is transferred without sending the particle itself. This task requires two entangled particles — in which measuring the state of one particle determines the state of the other, even when the particles are separated by a large distance.

Although, in principle, any quantum particle could be used for these tasks, photons are the preferred carriers of information in quantum communication because they are less affected than other particles by changes to their environment. Indeed, QKD and quantum teleportation have been successfully demonstrated in photonic systems using both optical-fibre and free-space communication channels over distances of up to a few hundred kilometres[4,6]. However, any effort to extend the communication range in these channels will inevitably hit the fundamental barrier of losses suffered by light. This limitation exists for classical optical communication as well, but in these systems, signals can be amplified and regenerated — this is not possible for their quantum counterparts.

In space, photons can travel great distances almost undisturbed, and there is advanced

50 Years Ago

The economic utility of the mineral deposits within the more distant future may primarily depend on how much the cost of trips to the Moon can be reduced, particularly through the advent of the atomic rocket. With the gradual exhaustion of the small number of top grade terrestrial deposits our mining techniques and metallurgy tend to become more and more adapted toward the exploration of lower grade and more extensive deposits. It may be that a considerable number of top grade deposits … will be found on the surface of the Moon. Another potential economic advantage may be that the lunar deposits may, to some extent, compensate the terrestrial ones because of the different conditions which prevailed in the course of their genesis.
From *Nature* 9 September 1967

100 Years Ago

During the total phase of the eclipse by the moon on July 4–5, 1917, it was remarked by several observers that the brightness of the disc was sensibly greater near the limb than towards the centre. It has been suggested … that this appearance may possibly indicate a feeble luminosity of the surface of the moon. An experiment which appears to support this view is described by M. Nodon. A brass ball … was placed in a dark box, of which only one side was open, and was viewed in a feeble light; the appearance observed was that of a disc brightest at the centre … in the case of a sphere which was uniformly coated with a slightly phosphorescent substance, the luminosity was greater at the edges than at the centre. Phosphorescence of some of the materials composing the lunar surface is accordingly suggested as a possible explanation of the distribution of luminosity observed during the eclipse.
From *Nature* 6 September 1917