extremely difficult. The Chinese researchers hope that transmitting photons through space, where they travel more smoothly, will allow them to communicate over greater distances.

At the heart of their satellite is a crystal that produces pairs of entangled photons, whose properties remain entwined however far apart they are separated. The craft's first task will be to fire the partners in these pairs to ground stations in Beijing and Vienna, and use them to generate a secret key.

During the two-year mission, the team also plans to perform a statistical measurement known as a Bell test to prove that entanglement can exist between particles separated by a distance of 1,200 kilometres. Although quantum theory predicts that entanglement persists at any distance, a Bell test would prove it.

The team will also attempt to 'teleport' quantum states, using an entangled pair of photons alongside information transmitted by more conventional means to reconstruct the quantum state of a photon in a new location.

"If the first satellite goes well, China will definitely launch more," says Lu. About 20 satellites would be required to enable secure communications throughout the world, he adds.

The teams from outside China are taking a different tack. A collaboration between the National University of Singapore (NUS) and the University of Strathclyde, UK, is using cheap 5-kilogram satellites known as cubesats to do quantum experiments. Last year, the team launched a cubesat that created and measured pairs of 'correlated' photons in orbit; next year, it hopes to launch a device that produces fully entangled pairs.

Costing just $100,000 each, cubesats make space-based quantum communications accessible, says NUS physicist Alexander Ling, who is leading the project.

A Canadian team proposes to generate pairs of entangled photons on the ground, and then fire some of them to a microsatellite that weighs less than 30 kilograms. This would be cheaper than generating the photons in space, says Brendon Higgins, a physicist at the University of Waterloo, who is part of the Canadian Quantum Encryption and Science Satellite (QEYSSat) team. But delivering the photons to the moving satellite would be a challenge. The team plans to test the system using a photon receiver on an aeroplane first.

An even simpler approach to quantum space science, pioneered by a team at the University of Padua in Italy led by Paolo Villoresi, involves adding reflectors and other simple equipment to regular satellites. Last year, the team showed that photons bounced back to Earth off an existing satellite maintained their quantum states and were received with low enough error rates for quantum cryptography (G. Vallone *et al. Phys. Rev. Lett.* **115,** 040502; 2015).

Researchers have also proposed a quantum experiment aboard the International Space Station (ISS) that would simultaneously entangle the states of two separate properties of a photon to make teleportation more reliable and efficient.

As well as making communications much more secure, these satellite systems would mark a major step towards a 'quantum internet' made up of quantum computers around the world, or a quantum computing cloud, says Paul Kwiat, a physicist at the University of Illinois at Urbana–Champaign who is working with NASA on the ISS project.

Eventually, quantum teleportation in space could even allow researchers to combine photons from satellites to make a distributed telescope with an effective aperture the size of Earth — and enormous resolution. "You could not just see planets," says Kwiat, "but in principle read licence plates on Jupiter's moons." ■

**CORRECTION**

The News story 'Canada builds quake warning system' (*Nature* **534,** 446–447; 2016) incorrectly stated that the warning system being developed by Ocean Networks Canada would be the first in Canada.