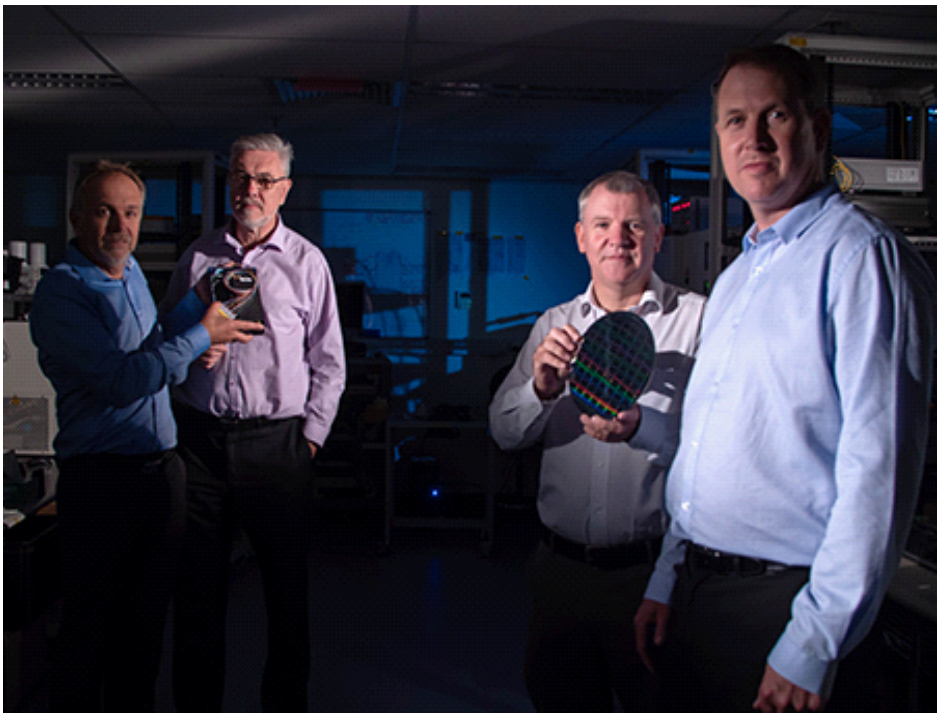
Switching light for faster, more reliable internet

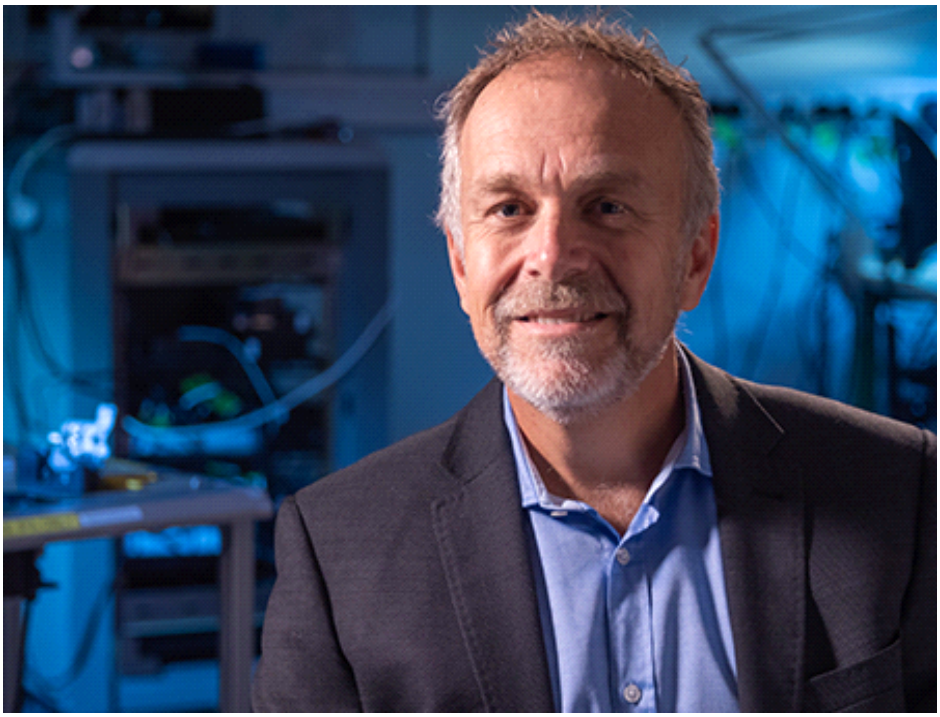
21 Oct 2018

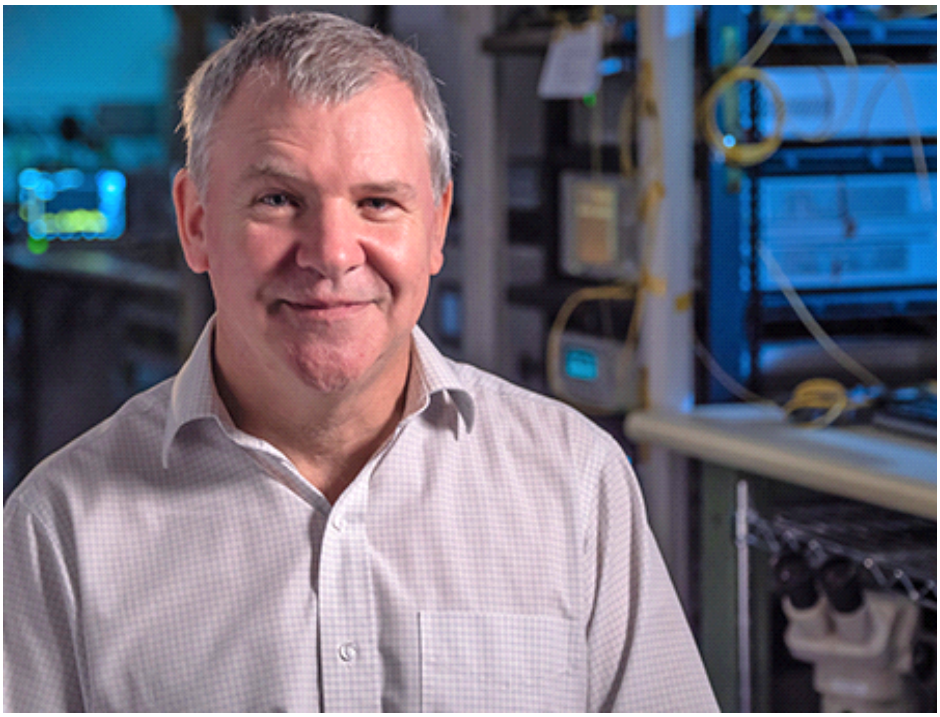
Author: *Niall Byrne – Prime Minister's Prizes for Science*
Photography: *Prime Minister's Prizes for Science/WildBear*
Video:

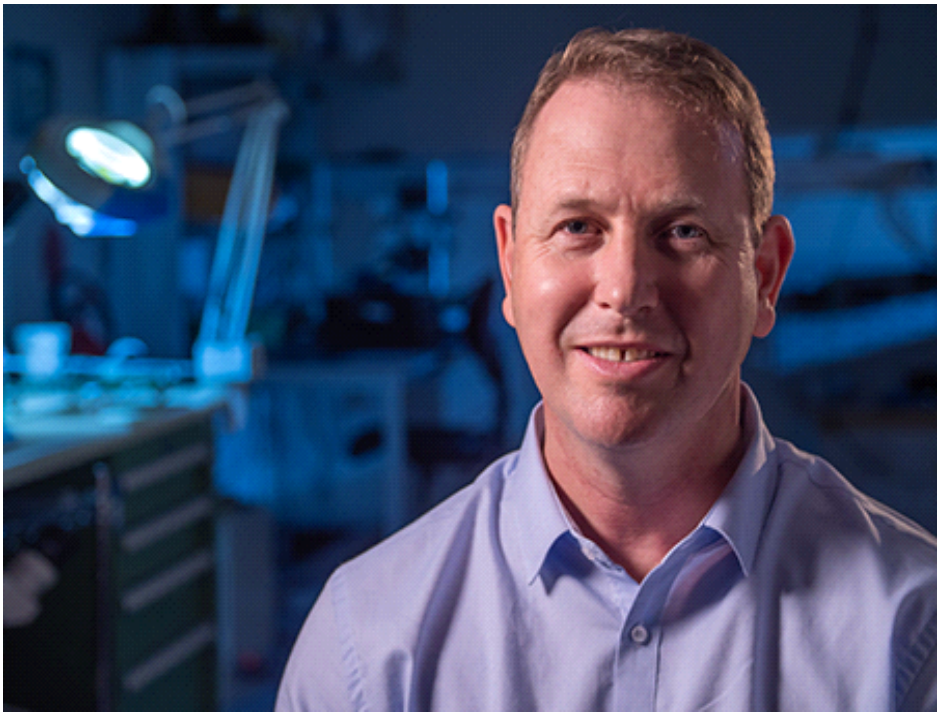
For creating and commercialising technologies that underpin the global internet, Dr Simon Poole, Mr Andrew Bartos, Dr Glenn Baxter and Dr Steven Frisken received the $250,000 Prime Minister's Prize for Innovation. Their company, Finisar Australia, is based in Sydney.

Tags
- Innovation
- Australia
- Award
- Business
- Digital
- ICT
- IT
- Technology
- Science









Finisar have created technologies that make global internet connections faster and more efficient. About half of the world’s internet traffic travels through devices developed by the team and made in Sydney.

The global internet we rely on is carried by optical fibres that link continents, countries and cities. The speed and volume of internet traffic was limited by the need to convert data from light to electrical signals for switching and processing. To tackle the problem, the Finisar team created light-bending switches using prisms, liquid crystals and silicon, which have dramatically improved the capacity and reliability of the internet. One switch can handle a million simultaneous high-definition streaming videos. The team are now working on boosting the capacity of their devices further to meet the demands of 5G and the Internet of Things.

In 1666 Isaac Newton used a prism to split white light into its constituent colours.

Today, a small optical device invented in Sydney uses high-tech prisms to split light into more than 100 coloured beams of light and switch them from one optical fibre to another allowing the devices to handle 10 terabits per second.

Finisar's Flexgrid Wavelength Selectable Switches are used by the world's major telecommunication companies wherever people need high-speed internet and mobile phone access, from Sydney and New York to the mountains of Kenya, the deserts of the United Arab Emirates, and the jungles of Peru. The switches allow optical fibres—once only used for the inflexible long-haul conduits joining cities and countries—to handle more data more nimbly, as well as making them more efficient and reliable.

Finisar's devices have made fibre optics cheap to use over short connections, and allowed internet traffic to grow in volume and drop in price. By carrying many signals at the same time and switching rapidly between fibres, they have transformed point-to-point optical fibres into adaptable mesh networks. Because the switches are controlled by software, they let network managers rapidly reroute traffic when there's a network fault. The Flexgrid concept has also been adopted into international standards.

The patented technology was created by a team of four engineers in Sydney who thought they could beat the world's biggest telecommunications companies and solve a problem that was holding back the growth of the internet.

Back in 2001 the capacity of the internet was limited. Optical fibres carried data from point to point, for example from Sydney to Los Angeles, or Melbourne to Canberra, and plugged into slower electric signal networks for local connections.

Simon Poole says there were problems with both capacity and reliability.

"Large companies were spending billions of dollars looking for solutions. The four of us had all worked in optics, and we were looking for something to contribute after the dot-com collapse," he says.

"We could see that there was huge scope for optics in the network, as a lot of other people could," says Andrew Bartos.

"But we could see that the networks were too inefficient, too inflexible. So we took a contrarian view. We looked for something completely different, something unorthodox, and we came up with this idea." The initial inspiration came from a data projector that was available at the time, which used a technology called Liquid Crystal on Silicon (LCoS).

"This technology was great for projecting images up onto a screen and I thought I could see a way that we could use it to project different colours of light into different fibres," Steven Frisken says.

"That set us on the path to creating an optical wavelength switch."

The device has three major components: a prism that's able to divide the light into many different colours, a Liquid Crystal on Silicon chip that can steer the light into different optical fibres, and the algorithms that manage the device.

It took a significant effort to persuade their customers—manufacturers of networking equipment that incorporates Finisar's switches—that such a small company in Sydney could take on a problem this big. Members of the team spent a lot of time in aircraft flying not just to the customers but also to the end users, the telecommunications companies who were working with the devices in their networks.

The company was originally called Engana. Today it is part of Finisar, a Nasdaq-listed company in the US. They have 230 people at their Sydney base, where they design, assemble, sell and support the devices with the aid of teams in China, Korea and America. All the devices are exported from Australia for integration into systems sold by the world's telecommunication companies.

The Finisar team aren’t done with innovating. They’ve recently introduced a product that not only switches light in networks but also measures signal quality, and they’re continuing to work on ways of pushing still more data through the optical fibres.

The team’s innovations and mentoring are now seeding a new generation of optics-based companies, including Cylite, which is developing eye care diagnostics, Baraja for autonomous vehicles, and Terra15 for geophysical sensing.
