Photonics to revolutionise internet speeds

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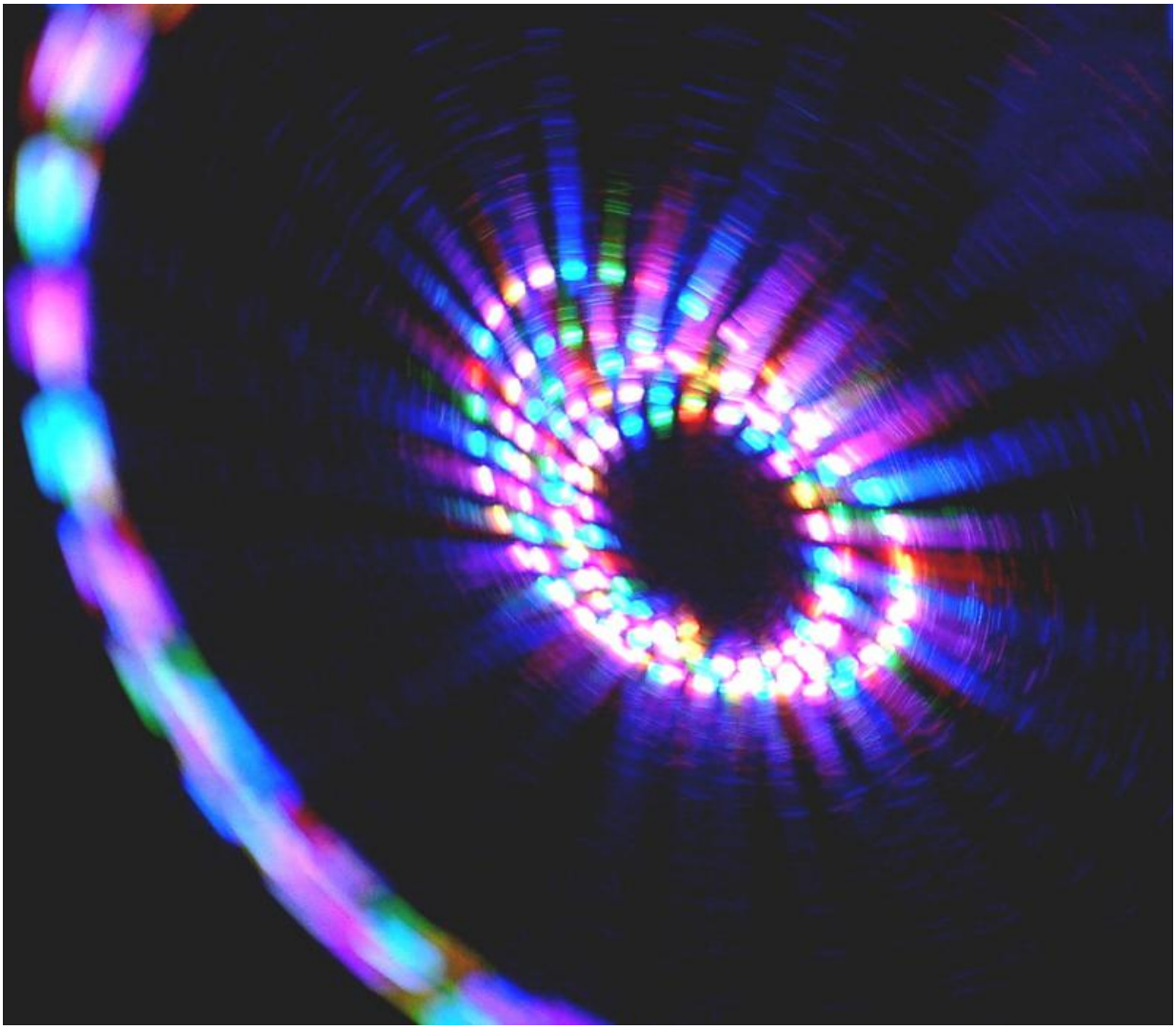

The stumbling block has been the fundamental nature of light. Credit: Steve Jurvetson

While people may have never heard of photonics before, they will surely have heard about the technology that relies on its existence, namely the internet, computers and smartphones.

Therefore people should appreciate how groundbreaking research in photonics is changing the very fabric of our lives.

This formed part of the message from Professor Benjamin Eggleton, Director of the Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), who recently presented the first talk of UWA's LightTALKS Lecture Series.

"Photonics deals with the control and manipulation of photons, the building blocks of light—and by light, we're talking about the electromagnetic wave," Prof Eggleton said.

"It has had enormous impact on society, [being] central to visualising displays, microscopy and transformative technologies in health, astronomy, storage and broadband-ready information.

"Photonics is the backbone of the modern internet."

Prof Eggleton said few people realise internet traffic and mobile communications are carried exclusively by a global optical fibre network running under the oceans, not satellites.

Photonics could significantly increase internet speed

Now, photonics and CUDOS are on the verge of revolutionising the internet once again through the 'photonic chip', which could allow for speeds and data transfer a thousand times faster than current levels.

This is because a photonic chip would make the electronic router

obsolete, removing the need to convert data from photons in optical fibres to slower electrons.

The chip's physical development is straightforward, with researchers applying the micro-fabrication technologies of electronics to photonics, and using lithography to print at the micro-scale on integrated chips.

The stumbling block has been the fundamental nature of light.

Unlike electrons, which react with one another and allow for the switching on and off of a computer's billions of transistors, photons don't interact with photons—which is where non-linear optics comes in.

"What we can do, it turns out, is interact photons with photons via the medium itself—the light beam modifies the medium at an atomic level and this change in the medium will affect another light beam," Prof Eggleton said.

This makes possible the concept of an optical transistor, one whose process is instantaneous.

Prof Eggleton said the photonics revolution is in its infancy and promises amazing technological advances.

This includes real-life Harry Potter-style invisibility cloaking, which is possible thanks to nano-resonators creating magnetic properties in light that are nonexistent in nature.

"It is real, and it works really well at microwave frequency," Prof Eggleton said.

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