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On the track of photonics Grail
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A GROUP of Australian researchers has joined the race to develop the first miniature photonic chip, considered the Holy Grail of photonics.

The government-backed Centre for Ultrahigh-bandwidth Devices for Optical Systems is working to create a device that will use light in the same way that existing chips use electrons.

CUDOS, which began in 2003 under the Australian Research Council's Centres of Excellence scheme, is a collaborative venture combining the expertise of CSIRO and five universities: Macquarie, Sydney, ANU, Swinburne and UTS.

Photonics is the branch of optics that involves the generation, transmission, detection and analysis of light as a way to convey, collect and process information.

The ultimate aim is to produce a miniature (1mm) photonic chip, on which to build the next generation of optical systems.

Macquarie CUDOS Node director Michael Withford said the chip had to be smaller, faster, cheaper and more robust than silicon wafer chips with copper wiring.

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"Our primary focus now is more a telecommunications one because there is a limitation in the bandwidth or the rate at which data can be transferred across fibre-optic networks," Dr Withford said.

Network speeds were still restrained by the signal processing devices at the ends of the cables that received and channelled data.

"Our motivation is to try to make all-optical switches, so you can measure the signal optically and switch it to one path or another without actually having to convert it to an electronic one, read it, and then convert it back," Dr Withford said. "That is where most of our optic fibres are bogged down at the moment."

At Macquarie University, PhD student Martin Ams is working on fabricating microscopic pathways within the chip, along which the light will be guided.

Fellow Macquarie and CUDOS PhD student Andrew Lee is working on photonic crystals that reflect certain wavelengths of light, while allowing others to pass through.

Other CUDOS researchers are working on microscopic switches, circuits, amplifiers and other features completely photonic.

CUDOS, which receives \$2 million a year over five years from the ARC, is expected to have working prototypes in the next few years.

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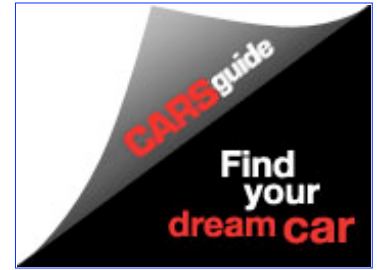
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"Theoretically, we are probably leading the world in many aspects, although experimentally, in trying to demonstrate working devices, we are playing catch-up, but we hope to get there," Dr Withford said.



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