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Light stuff: Optical microchip breakthrough reported at U of T

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TORONTO (CP) -- Canadian-based researchers have reported a world-beating breakthrough in photonics -- the emerging science of using light instead of electrons in computers and other devices.

While it's now commonplace to run lasers through glass fibre to transmit data, fibre-optic technology currently ends where information processing begins: the light pulses must be converted to electron flows administered by computer chips.

Major corporate and university research teams worldwide have been devoting massive resources to developing an all-optical system.

Now, University of Toronto researchers affiliated with the Canadian Institute for Advanced Research say they have produced a silicon-based material that can trap light, controlling it the same way microchips control electrons.

An optical microchip would be revolutionary -- potentially much faster and more efficient than electronic chips and opening up wide new possibilities for innovative technology.

"This is what everyone has been waiting for in order to go all-optical," Geoffrey Ozin, a U of T materials chemist who developed the material with Sajeew John, a theoretical physicist, said Friday.

The technology could be as "disruptive" as the replacement of vacuum tubes by

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transistors, Ozin said.

John has been working on theories of "caging" light since doing his Harvard PhD thesis in 1984. Ozin -- working independently in the building next to John's -- had been developing ideas on laying down silicon on porous materials.

Ozin's techniques for growing silicon in holes -- in this case the crystalline structure of opals -- were what John needed.

"Even with the laser and all the things it can do, there has not been any real material that can micro-manipulate the flow of light in the same way that the semiconductor does to electrons," John said.

"And that's why this line of research, and in particular this breakthrough, is really important."

A spokesman for the institute said John, Ozin and a student of Ozin, Emmanuel Chomski, hold the intellectual property rights to the development.

"Clearly, every major corporation in the world is looking at this," Ozin said. "The question is, where do we go from here?"

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