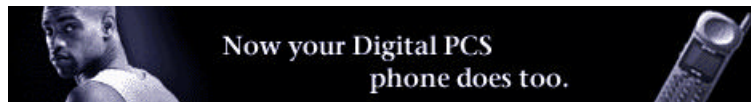


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May 27, 2000



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U of T team in race to develop `optical chip'

`This is the next trillion-dollar industry': Backer

By John Spears
Toronto Star Business Reporter

A trio of researchers at the University of Toronto have produced a groundbreaking material that could use light pulses, instead of electrons, to drive computers and other devices.

"This is the next trillion-dollar industry," said Gerard Lynch, chief executive of Photonics Research of Ontario, which has helped support the research.

Lynch likened the production of the material, which can trap and manipulate light signals, to the invention of the transistor, which replaced the vacuum tube.

"The ultimate goal is to have the all-optical computer chip, meaning that all data processing and computing is done by light instead of electricity," said Sajeev John, the U of T physicist who developed the theory leading to the breakthrough.

The big question now, said team member Geoffrey Ozin, a U of T chemist, is whether Canadian researchers and companies can maintain the momentum and take advantage of the breakthrough.

Teams of researchers in public and private labs around the world have been working on the same problem and will be poised to jump, he said.

"It's a once-in-a-lifetime opportunity for Canada," Ozin said. "To me this is a matter of national concern."

The advantage of using light in computers is that light pulses don't interfere with each other the way electrical currents do.

Light signals can be packed tightly together, and even pass through each other. That permits smaller circuits and faster speeds.

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'It's a once-in-a-lifetime opportunity for Canada. To me this is a matter of national concern.'

- U of T chemist Geoffrey Ozin

And as telecommunications firms race to build optical networks, they'll need more optical components.

The new material "would make things much more seamless, potentially faster, potentially better performance for some of the optical interconnects," said John - who was in Ottawa yesterday talking to officials at Nortel Networks Corp.

But the road to the new material, developed in collaboration with Ozin and Henry van Driel, was a crooked one. In fact, Sajeev John journeyed all the way to Spain before he learned the man who could help with his revolutionary idea - Ozin - worked in the building next door, back at U of T.

John's idea, developed in the 1980s, was to build a three-dimensional lattice of material, unlike a two-dimensional microchip. Each strand in the lattice would be 1.5 microns in diameter. There are 10,000 microns in a centimetre.

The reason for the specific diameter: It matches the wavelength used in optical telecommunications signals, and can trap and re-route the photons, or particles.

Unluckily, no one could figure out how to build the delicate latticework. Ozin, for one, had no interest. He was developing strands of material thousands of times thinner and designed to carry electrons.

Then John visited a lab in Spain, where scientists were building perfect, synthetic crystals of opal. John knew that the spaces between the silica spheres that make up an opal crystal are 1.5 microns wide - just the framework needed to build his latticework.

The problem: How to delicately coat the crystalline spheres with silicon, then remove the crystal and leave the silicon latticework.

The Spaniards said that was just the sort of thing that Ozin might be good at - in his chemistry lab back at U of T.

When John returned home and pitched his ideas to Ozin, he eventually agreed. Working with John and Van Driel, they developed a chemical process for producing the material.

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