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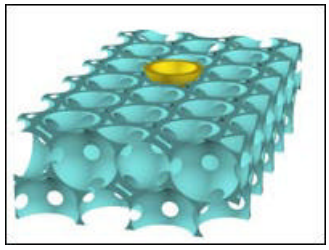
# Shedding light on silicon May 30, 2000



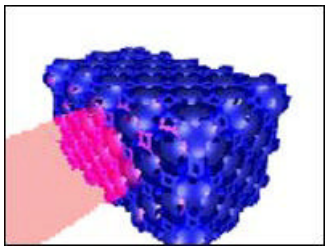
*Future computer chips may contain this silicon structure*

University of Toronto researchers have created a tiny crystal that may revolutionize the entire telecommunications and computer industry. The discovery - a silicon photonic crystal - enables light to be efficiently trapped and used in computer chips instead of electricity.

Physics professor Sajeeve John, a member of the U of T research team, says scientists around the world have been trying for over a decade to develop a material that could effectively cage light. But up until now they have been largely unsuccessful.

"Recently, I made a theoretical road map of how this particular structure might be put together and the recipe that would go into that," says John who has been studying photonics for about 16 years. About a year ago, John found scientists in Spain that could provide the team with the essential templates for making the crystals. He then put together a group in the university physics department to do the optical procedures.

According to John, the Spanish researchers, are international leaders in the creation of opal templates (glass balls) that develop into crystal. These templates are eventually used to create the *photonic bandgap* that localizes the flow of light. One of the final steps in the process involves drilling holes into the crystal. These holes then act as channels that enable the flow of light.



*Large scale inverted opal silicon*

The university researchers referred to the project as the *man on the moon* project because it involved extreme precision and perfection. Apparently, the template must be created to measurements of near perfection and spaces between the glass balls must be filled with silicon to a level of exactly 90 and 95 per cent.

The crystal used for this process is unlike the others that were tested before. "The advantage of this crystal is that it basically turns off the laws of electromagnetism over a certain frequency range. If this doesn't happen then light will travel in any direction that it wishes - just like in an ordinary empty space. So this material provides a cage [for the light]."

Today, computer chips use electrons to process information. And although some of these computers might seem fast, the use of light to handle information would produce systems that are even faster and more intelligent.

"[The crystal] removes some of the fundamental barriers that have prevented things like faster computers and computers that have neural architecture similar to the architecture of the human brain," says John. "So we think that there are a lot of treasures out there and we don't know how far away the horizon is at the moment."

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