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## Tiny Pathways See The Light March 18, 2002

By John Rendleman

Researchers at the University of Illinois at Urbana-Champaign have developed a way to create optical pathways small enough to be used in a new class of optical switches and computers.

The technique could enable the simple, inexpensive construction of optical components that manipulate signals along routes less than 1-micron wide or around bends with radii in the 1-micron range. It could be used in futuristic components such as microlasers, optical switches, optical transistors, and tunable lasers, and may become the basis for new types of networking and computing devices, scientists say. The technique could result in optical integrated circuits, which would be the building blocks for optical computers capable of performing calculations hundreds of times faster than those made with electronic integrated circuits.

The researchers have created optical waveguides within photonic crystals, known as 3-D photonic bandgap materials, using a laser beam that "writes" the waveguides within a silicon crystal. A laser beam is focused inside a photonic crystal composed of uniform spheres of silicon, treated beforehand with a photoreactive monomer liquid. At its focal point, the laser creates a 3-D pattern within the crystal by turning the monomer liquid into a polymer solid, which defines the shape of optical waveguides.

The experiment results in waveguides 1.58-microns wide. It proves "we can write a [3-D] pattern, and we can do that within the crystal," says Paul Braun, assistant professor of materials science and engineering at the university and lead scientist in the experiment. The optical waveguides could work side-by-side with conventional integrated circuits on the same chip, he says. The laser-writing process is simpler and potentially less expensive than other techniques for making optical waveguides, which include building them layer by layer.

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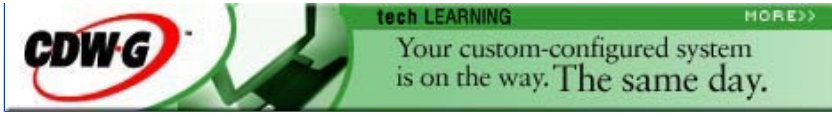
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