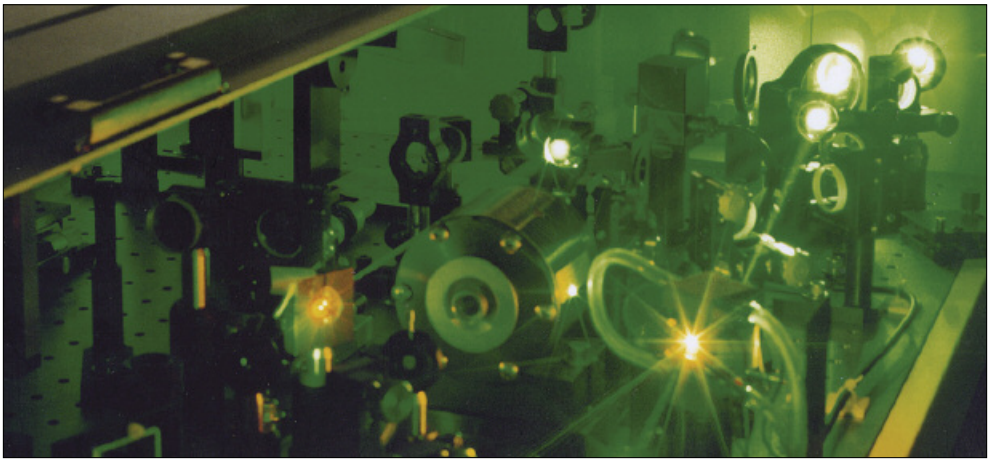
Ideas on the Edge

Applied Solutions

TED SARGENT IS APPLYING NANOTECHNOLOGY TO A VARIETY OF SURFACES AT HIS UNIVERSITY OF TORONTO LAB—AND SOLVING A VARIETY OF PROBLEMS.

Are computer chips hitting a speed bump? Are solar cells inefficient? Are digital cameras blind in the dark? Is genetic testing too expensive?

TED SARGENT

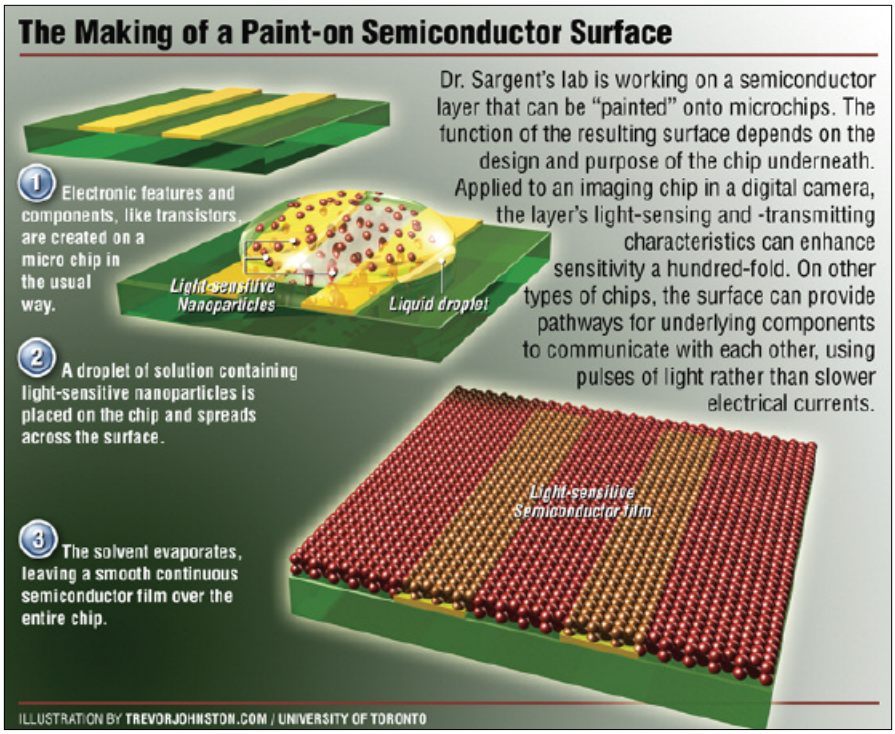


For all of these problems, Dr. Ted Sargent has a solution. Literally.

Dr. Sargent and his team of researchers at the University of Toronto are perfecting techniques for growing precisely structured and incredibly tiny particles in a solution that can be painted onto almost any surface. Depending on the nature of the particles and the surface, the coating that results—think dry paint—can fulfill an astonishing variety of functions.

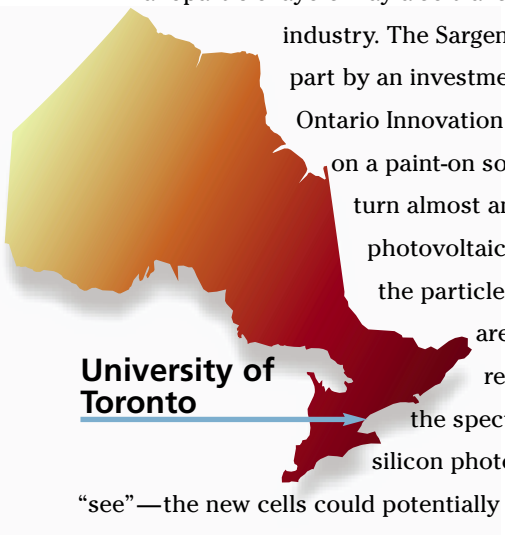
The secret is in the nanoparticles. These tiny objects—as small as 20 atoms across—can be engineered to react in very specific ways to light or electricity.

The technology may soon solve a speed problem affecting computer chips. While the millions of transistors on a chip work at blazing speeds, they communicate with each other over relatively slow electrical connections. But a thin overlay of nanoparticles could function as a matrix that connects the transistors using much faster pulses of light. "We can paint these semiconductor particles right onto the chip," explains Dr. Sargent, "and then turn the dried paint effectively into a laser." Similar technology may also relieve Internet speed



bottlenecks caused by the need for routers to convert fibre-optic signals to much slower electrical current and then back to light.

Nanoparticle layers may also transform the energy industry. The Sargent lab—funded in part by an investment from the Ontario Innovation Trust—is working on a paint-on solution that could turn almost any surface into a photovoltaic cell. And because the particles in the coating are sensitive to infrared light—a part of the spectrum conventional silicon photovoltaics can't "see"—the new cells could potentially capture twice as much solar energy. The technology could even be applied to clothing. "Your jacket could be solar," speculates Dr. Sargent.



The list of applications goes on. Nanoparticle coatings on camera sensors may make cities safer places by enabling the manufacture of cheap security devices that can see in the dark. And the technology has important implications for medicine as well. Paint-on semiconductors may lead to a hundred-fold reduction in the costs of optical chips for genetic testing, bringing revolutionary diagnostic and treatment-tracking procedures within the reach of local clinics.

The cost-saving element figures largely in much of Dr. Sargent's research. "Nanotechnology can sound kind of futuristic and expensive," he says. "But in fact, everything we're doing is aimed at making materials and devices that in many cases could be a lot cheaper than what we have today."

RESEARCH THAT MATTERS
REAL-WORLD BENEFITS FOR ONTARIANS:
- inexpensive genetic testing
- more efficient and versatile solar cells for cleaner energy
- more powerful computers and faster Internet connections

Project: Enabling the Information Age through Nano-Effect Materials, Devices, and Systems
Institution: University of Toronto
Principal Investigator: Dr. Edward Sargent
Trust Investment: $376,000
CFI Investment: $376,000
Total research investment from all sources: $952,000

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Infrastructure for Innovation
About the Ontario Innovation Trust

The Ontario Innovation Trust was created in 1999 by the Government of Ontario to invest in research equipment and facilities at Ontario's universities, colleges, hospitals and other non-profit research institutions. The Trust is governed by a volunteer Board of Directors, according to the terms of a Trust agreement established by the Ontario government. A small permanent staff looks after day-to-day operations.

Since its inception, the Trust has committed almost $843 million to strengthen Ontario's position in the global marketplace of ideas. This represents more than a third of the $2.44 billion in total funding that has been invested in Trust-supported projects.