

# Ideas on the Edge

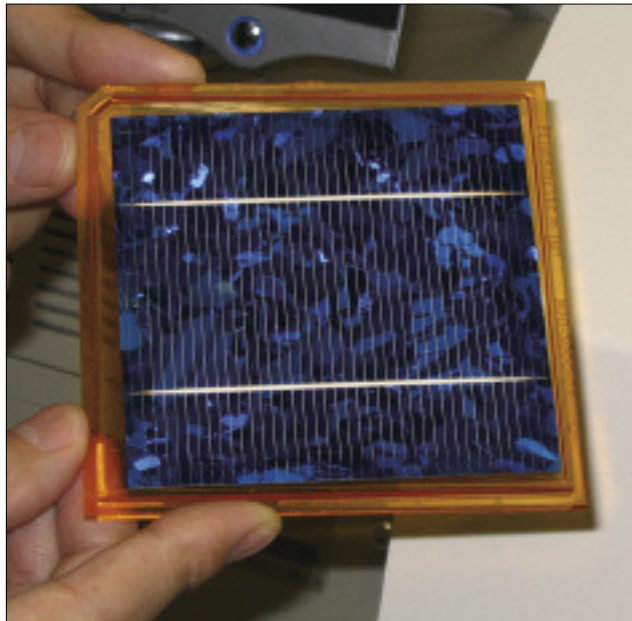
## From Desktop to Rooftop

SOLAR POWER MAY FINALLY FREE US FROM OUR ADDICTION TO FOSSIL FUELS. UNIVERSITY OF WATERLOO RESEARCHER SIVA SIVOTHTHAMAN IS LOOKING FOR WAYS TO MAKE IT MORE AFFORDABLE.

“We’re not interested in fabricating the most efficient solar cell in the world,” says Dr. Siva Sivoththaman of the

cheaper—and that’s going to require some technological breakthroughs.

In the search for more affordable solar cells, Dr. Sivoththaman and his colleagues are taking a broadbased approach. “If you want to make a real impact,” he says, “you need to influence every aspect of the technology. That means looking at materials, devices, systems and electronics. I like to say we have a comprehensive research facility that takes us from desktop to rooftop.” The 1400-square-metre lab—unique in the world for the range of its capabilities—is being funded in part by an



DR. SIVA SIVOTHTHAMAN

University of Waterloo. “We’re interested in fabricating the cheapest.”

That sort of market-oriented perspective shapes much of the research at the Centre for Photovoltaic Systems and Devices, where Dr. Sivoththaman is the director. He believes that photovoltaic technology will play an important role in reducing our dependence on fossil fuels. But for that to happen, solar power has to become significantly

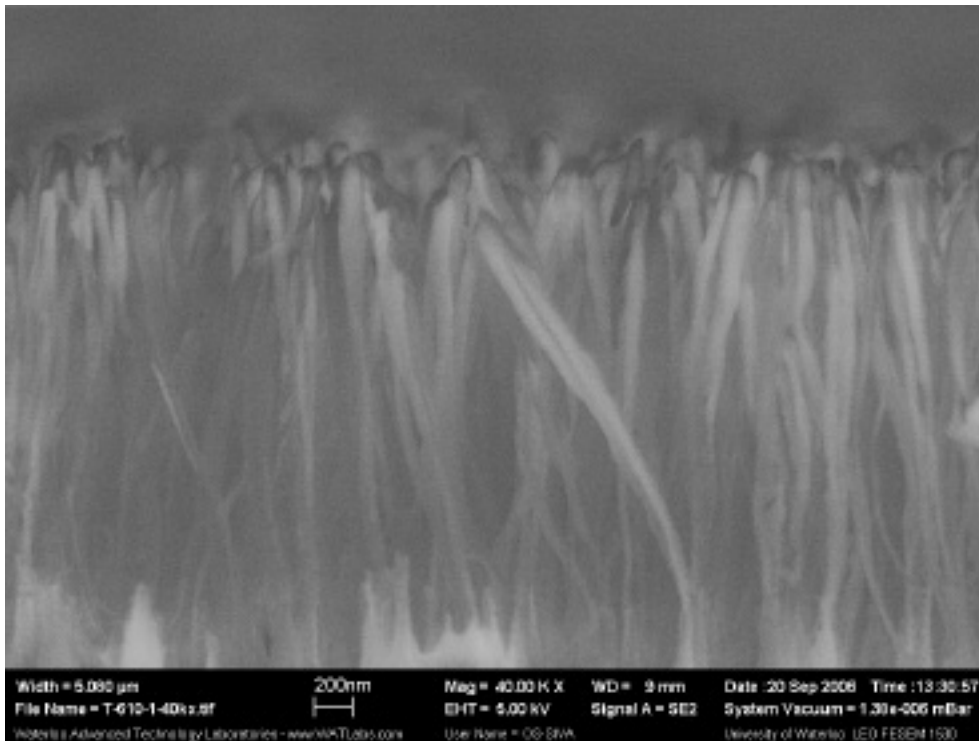
investment from the Ontario Innovation Trust.

A key avenue of research focuses on silicon, the material that dominates 90 percent of today’s photovoltaic market. “Silicon is one of the most abundantly available materials on earth,” says Dr.

Sivoththaman. “It’s the purification steps that make it so expensive. So we’re looking at fabricating photovoltaic devices with low cost silicon materials, and reduced numbers of purification

### RESEARCH THAT MATTERS REAL-WORLD BENEFITS FOR ONTARIANS:

- Potential for affordable, pollution-free electricity.
- World leadership in the alternative energy sector, leading to jobs and investment.



*Deploying nanoscale structures can help engineer future photovoltaic devices.*

steps.” Cheaper silicon makes solar cells less efficient, but the potential decrease in cost may far outweigh the loss in performance.

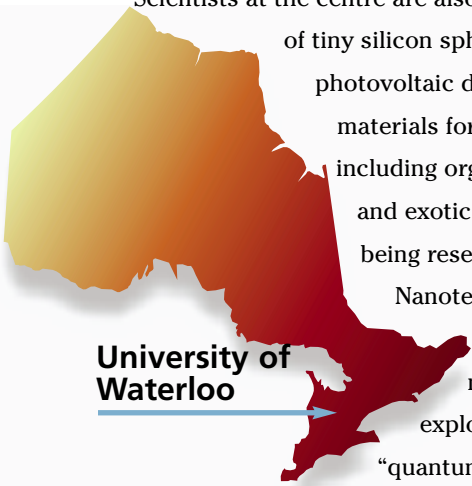
Scientists at the centre are also investigating the use of tiny silicon spheres for advanced photovoltaic devices. Alternative materials for future photovoltaics, including organic semi-conductors and exotic thin films, are also being researched.

Nanotechnology is another focus, as it is in so many disciplines. By exploiting the bizarre “quantum effects” that hold

sway at this atomic scale, it may be possible to sidestep what were once considered fundamental limits of solar cell performance. Dr. Sivothythaman is also creating “spectral-engineered” solar cells by deploying nano-scale structures onto the devices.

Even this kind of exotic research, however, is being driven by a very practical agenda. “Our primary focus,” says Dr. Sivothythaman, “is solar cells at an affordable price. What we want is to make a real impact.”

**Project:** Centre for Advanced Photovoltaic Devices and Systems  
**Institution:** University of Waterloo  
**Research Sector:** Engineering  
**Principal Investigator:** Siva Sivothythaman  
**Trust Investment:** \$3,069,911  
**CFI Investment:** \$4,454,957  
**ORF Investment:** \$1,385,046  
**Total research investment from all sources:** \$12,294,913



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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.