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# Professor Edward Sargent

## University Professors 2015

**Faculty of Applied Science & Engineering,  
Edward S. Rogers Sr. Department of Electrical and Computer Engineering**  
**Research Interests:**



**The application of nanomaterials in sustainable energy and sensing**

## Biography

Professor Edward (Ted) Sargent earned his B.Sc. in Engineering Physics from Queen's University in 1995 and Ph.D. in Electrical and Computer Engineering (ECE) from the University of Toronto in 1998. He was appointed Assistant Professor in ECE at the University of Toronto in 1998; Associate Professor in 2002; then appointed Full Professor in 2005. Sargent was Visiting Professor of Nanotechnology and Photonics at MIT from 2004-2005. He served as Associate Chair, Research for the Edward S. Rogers Sr. Department of Electrical and Computer Engineering from 2009-2012 and currently as Vice-Dean, Research for the Faculty of Applied Science and Engineering.

In his research, Professor Sargent has deployed innovations in materials chemistry to address key challenges in sustainable energy. Prior to his work, the optoelectronics community built devices for light sensing and energy conversion principally using materials composed of perfect, pure semiconductors known as epitaxial crystals. Sargent devoted his attention to making practical devices using 'soft materials' –

materials that could conveniently and cost-effectively be processed from the solution (liquid) phase. By tackling this challenge, Sargent set the stage to make path-breaking advances at the forefront of this new field.

Professor Sargent focused on colloidal quantum dots (CQDs), solution-processed nanometersized particles of single-crystal semiconductor. In 2005, Sargent reported the first solution-processed infrared solar cell. This seminal work has become synonymous with full-spectrum solar cells: photovoltaic devices matched to the sun's broad range of wavelengths. His *Nature Materials* paper on the subject from that year has been cited over 1000 times. Professor Sargent has improved the efficiency of CQD solar cells by orders of magnitude since that time. As of 2015, Sargent's solar cells are the highest performing CQD solar cells in the world and the most efficient solution-processed infrared solar cells in existence.

Ted Sargent has also built an international reputation for his work on highly sensitive detection of light using solution-processed materials. He showed how to build remarkably sensitive infrared light detectors that can readily be integrated with silicon electronics. His report in *Nature* in 2006 constituted the first solution-processed device to exceed in performance its conventional, single-crystal counterpart. In 2009, he reported in *Science* the first direct electronic observation of the then-emerging phenomenon of multi-exciton generation.

Professor Sargent has made multiple breakthroughs in novel materials and devices for sustainable energy and innovation technology. He has disseminated his advances in the top interdisciplinary scientific journals and has addressed a broad audience on the impact of modern nanotechnology through his widely translated book *The Dance of Molecules*. Professor Sargent's works have been cited over 12,000 times and he has an h-index of 59. He has given invited institutional lectures at Stanford, MIT, UPenn, Berkeley, Caltech, Harvard, Cornell, Columbia, UCLA, Penn State, University of Texas-Austin, Georgetown, and UCSB.

Professor Sargent is the founding Program Director of the new global network *Bio-Inspired Solar Energy* recently announced by the Canadian Institute for Advanced Research. The network comprises a global research team from U of T, Cambridge, Amsterdam, TU Dresden, Harvard, Princeton, and Berkeley, UBC, U of A, Glasgow, University of Hong Kong, EPFL, and Laval. Professor Sargent is also the founder and CTO of InVisage Technologies, a company that produces quantum dot-based image sensors.

Ted Sargent was elected Fellow of the American Association for the Advancement of Science (AAAS) in 2009; named Fellow of the Institute of Electrical and Electronics Engineers (IEEE) in 2011; and elected Fellow of the Canadian Academy of Engineering in 2014. Sargent was awarded the Steacie Prize in 2012 for his innovative research in solar cell technology. In 2014 he was elected Fellow of the Canadian Academy of Engineering and the Royal Society of Canada.

