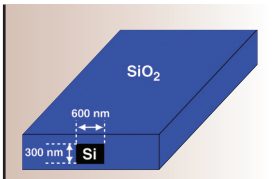
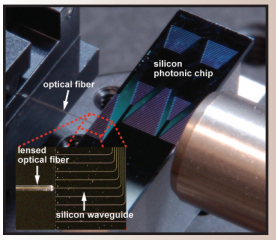
PicoLuz

In June of 2009 Alex Cable, Michal Lipson, and Alexander Gaeta together founded PicoLuz, LLC to commercialize novel silicon nano-photonics technologies. The name PicoLuz references both the scientific focus of the company, silicon nano-photonics, and the Spanish and Portugese personal histories of the founders.

Silicon photonics holds promise for a technological leap forward by seamlessly integrating photonic elements with electronics. From a nonlinear optical perspective, the large index contrast of silicon-on-insulator nanowaveguides combined with the large Kerr nonlinearity of silicon allows for effective nonlinearities that are more than three orders of magnitude larger than those achievable in silica glass fibers. PicoLuz will leverage the research done at Cornell University based on this extremely power-efficient platform In particular, research in four-wave mixing [see Opt. Express. 16, 1300-1320 (2008)] will be used to commercialize the silicon nano-waveguides technology.



Schematic of the waveguide structure (actual dimensions may vary)



A lensed optical fiber is being used to couple light into a waveguide on the silicon chip. The waveguide is visible in the magnified image.

FWM has been shown to be efficient and broadband in silicon provided that phase-matching conditions are met through the proper group velocity dispersion (GVD) choice. Silicon nanowaveguides can be engineered to have near-zero or anomalous GVD at a desired pump wavelength by properly designing the waveguide geometry. In waveguides with near-zero GVD, frequency conversion of continuous-wave light via FWM can be achieved over bandwidths approaching 100 THz [see CLEO 2009, CFR4]. The wavelength conversion process in these waveguides requires continuous-wave pump powers of only 100 mW [see Opt. Express. 15, 12949-12958 (2007)]. In waveguides exhibiting anomalous GVD, we have observed parametric amplification with peak powers on the order of 1 W [see Nature. 441, 960-963 (2006)]. Furthermore, using micro-resonator enhancement, we have observed FWM with extremely low peak powers below 1 mW [see Opt. Express. 16, 4881-4887 (2008)]. Many of these demonstrations have proved critical in enabling our research into all-optical information processing and broadband optical frequency generation and will provide the basis for novel PicoLuz products.

Michal Lipson, Associate Professor, Electrical and Computer Engineering, Cornell University

Michal Lipson completed her B.S., MS and Ph.D. degrees in physics at the Technion Israel in 1998. In December 1998, she joined the Department of Material Science and Engineering at MIT as a postdoctoral associate. She then joined the School of Electrical and Computer Engineering at Cornell University in 2001 as an Assistant Professor. Her research at Cornell involves novel on-chip nanophotonic devices. She was the recipient of the NSF CAREER award. Michal is also a fellow of the Optical Society of America.

Alexander L. Gaeta, Professor, Applied and Engineering Physics, Director, Center for Nanoscale Systems (CNS)

After receiving his doctoral degree in optics, Alexander Gaeta remained at the University of Rochester for two years as a postdoctoral research associate. He joined the Cornell faculty in 1992. He received Young Investigator Awards from the Office of Naval Research in 1993 and from the Army Research Office in 1995. He was a recipient of the College of Engineering Teaching Award in 1997 and 2000. Alex is a fellow of the Optical Society of America and of the American Physical Society.

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