



ECE Distinguished Lecture Series



David Miller

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"Saving Energy in Information Processing and Communications With Optics"

Time: Wednesday, November 1, 2017, 1:00 pm – 2:00 pm

Location: SEH B1220

Abstract

Information processing and communications is estimated to consume ~ 4.6 – 9% of all electricity, while internet communications traffic has been growing by factors of ~ 10 – 100 per decade. Reducing energy per bit processed or communicated is therefore essential; otherwise we cannot continue to scale our use of information because we run out of energy. Somewhat surprisingly, most of the energy inside the internet and in information processing machines is dissipated in local electrical interconnects inside electronic computing and switching machines, not in long distance connections and not in logic operations themselves. A second key constraint inside such electronic systems is that we run out of space for the connections. The talk will discuss how emerging optics and low-energy optoelectronics could address issues of interconnect energy and density, for all distances from the edges of chips to connections between cabinets. Key research areas include very close integration of electronics and optoelectronics, very efficient beam couplers (for example, with nanophotonic techniques), and use of dense, two-dimensional arrays of light beams. Silicon photonics technology and nanophotonics are both essential to exploit these opportunities. The prospect and goal is to reduce total energy for communication by x100 – x1000 for these short to medium distances, allowing us to transform the power, information capacity, and architecture of future information processing and communications.

Biography

David Miller is the W. M. Keck Professor of Electrical Engineering and a Professor by Courtesy of Applied Physics at Stanford University. Following his B. Sc. in Physics from St. Andrews University, he received his Ph. D in Physics from Heriot-Watt University in 1979. Before moving to Stanford in 1996, he was with Bell Laboratories from 1981 to 1996, as a department head from 1987. His interests include nanophotonics, quantum-well optoelectronics, and optics in information sensing, interconnects, and processing. He has published more than 260 scientific papers, a quantum mechanics text, and 74 patents, was President of IEEE LEOS (now Photonics Society) in 1995, has received several awards, is a Fellow of APS, OSA, IEEE, the Electromagnetics Academy, the Royal Society of London and the Royal Society of Edinburgh, holds two Honorary Doctorates, and is a Member of the US National Academies of Sciences and of Engineering.