



Computational Optical Sensing and Imaging
An Integrative Graduate Education and Research Training Program
University of Colorado at Boulder



COSI Seminar Series

Monday November 9th, 4:00 pm

School of Business Koelbel Building, Room 230

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“Nanophotonics for Information Systems”

Optics has the potential to solve some of the most exciting problems in computing hardware. It promises crosstalk-free interconnects with essentially unlimited bandwidth, data transmission without skew and without power- and time-consuming regeneration, miniaturization, parallelism, and efficient implementation of important algorithms. Yet, optical computing and processing in space and time has so far failed to move out of the lab. These systems are costly, bulky, and fragile in their alignment. They are also difficult to integrate with electronics, both in terms of the fabrication and in terms of delivery and retrieval of the massive volumes of data. Moreover, there exist applications that rely on our ability in interfacing optical devices and systems with other signal modalities such as for example biological and biochemical processes. These applications led us recently to establishing a new research area that we call optofluidics, where fluids are used to create new functionalities and establish efficient interfaces with biochemical systems.

Things may be changing, however. More recent work emphasizes the construction of optical subsystems directly on-chip, with the same lithographic tools as the surrounding electronics. This has been made possible by the advances in these tools, which can now create features significantly smaller than the optical wavelength; experts predict lithographic resolution as fine as 16nm by year 2020. Arranged in a regular pattern, subwavelength features act as a metamaterial whose optical properties are controlled by the density and geometry of the pattern and its constituents. Lenses, polarizers, chromatic dispersers, diffraction gratings, and other optical processing devices can now be implemented on-chip using metamaterials wherever natural materials with similar properties either do not exist, or (more frequently) would not be compatible with lithographic fabrication. We will present our recent research results on nanophotonics for information systems integration.



Y. Fainman received the Ph. D. from Technion in 1983. He is a Cymer Professor of Advanced Optical Technologies and Professor of ECE at the University of California, San Diego. His current research involves near field optical science and technology, nanophotonics and ultrafast optics. He is a Fellow of OSA, IEEE, and SPIE. He Chaired, co-Chaired and served on program committees for various conferences for OSA, IEEE/LEOS, and SPIE. For example, he was a General Chair for Inaugural OSA Topical Meeting on Nanophotonics for Information Systems, 2005 and served as a topical editor and board member for various journals.

More information on Prof. Fainman and his research can be found at: <http://emerald.ucsd.edu/Members/shaya.html>.