Colorado State University's Information Science and Technology Center (ISTeC)

presents <u>two</u> lectures by

Dr. Andrew Weiner

Scifres Distinguished Professor of Electrical and Computer Engineering
Purdue University

ISTeC Distinguished Lecture

in conjunction with the Physics Department and Electrical and Computer Engineering Department Seminar Series

"Ultrafast Parallel Optical Signal Processing"

Monday, February 5, 2007
Reception: 3:30 – 4:00 p.m.
Lecture: 4:10 to 5:00 p.m.
Hammond Auditorium (Engineering room 120)

Special Joint Electrical and Computer Engineering Department and Physics Department Lecture

sponsored by ISTeC

"Optical Pulse Shaping at Hyperfine Spectral Resolution"

Tuesday, February 6, 2007
Lecture: 1:30 – 2:30 p.m.
Engineering Building B2

ABSTRACTS

"Ultrafast Parallel Optical Signal Processing"

Ultrafast optical signal processing offers exciting possibilities to go beyond the processing speeds of electronics technologies for applications in high-speed fiber communications and ultrawideband wireless. In this talk I will review our recent work on processing of ultrafast optical signals via conversion between time, space, and optical frequency (Fourier) domains. Some specific topics that will be covered include optical arbitrary waveform generation, application of optical pulse shaping technologies for wavelength-parallel compensation of fiber transmission impairments, and new results on application of photonic methods for precompensation of dispersion effects in wireless transmission of radio-frequency signals over ultrawideband antenna links.

"Optical Pulse Shaping at Hyperfine Spectral Resolution"

Femtosecond pulse shaping, based on coherent parallel manipulation of optical frequency components, is now a well developed and widely adopted technique for optical arbitrary waveform generation. In contrast to the speed limitations of electronics technologies, pulse shaping becomes increasingly easy for very wide optical bandwidths corresponding to time features deep into the femtosecond regime. On the other hand, it is significantly more challenging to harness pulse shaping for applications (such as near-term fiber optic and ultrawideband wireless communications) demanding time apertures in the subnanosecond to nanosecond regime, corresponding to spectral resolutions on the order of GHz. In this talk I will describe recent work pushing pulse shaping towards new high spectral resolution limits. In particular, I will first describe grating-based pulse shapers allowing manipulation of individual lines in an optical frequency comb. Unlike previous work on "groups-of-lines" pulse shaping, in this new "line-by-line" regime the waveform generation process is highly sensitive to frequency fluctuations of the optical comb. Thus, manipulation of individual spectral lines leads to a new regime in which the important features of pulse shaping and of stabilized frequency combs are simultaneously relevant. I will then describe hyperfine optical pulse shaping systems based on virtually-imaged phased array (VIPA) spectral dispersers. VIPAs are etalon structures modified to provide a spectral dispersion function, similar to gratings but with substantially higher resolution (below 1 GHz). This unprecedented resolution opens up new applications in monitoring and manipulation of optical and radio-frequency signals.

SPEAKER BIOGRAPHY

Andrew M. Weiner (http://cobweb.ecn.purdue.edu/~amw/) graduated from M.I.T. in 1984 with an Sc.D. in electrical engineering. Upon graduation he joined Bellcore, first as Member of Technical Staff and later as Manager of Ultrafast Optics and Optical Signal Processing Research. Professor Weiner moved to Purdue University in 1992 and is currently the Scifres Distinguished Professor of Electrical and Computer Engineering. His research focuses on ultrafast optical signal processing and its applications in high-speed optical communications and radio-frequency photonics. He is especially well known for pioneering the field of femtosecond pulse shaping, which enables generation of nearly arbitrary ultrafast optical waveforms according to user specification. Professor Weiner has authored six book chapters and approximately 190 journal articles and 325 conference papers and is inventor of 9 U.S. patents. He has served as Co-Chair of the Conference on Lasers and Electro-optics and the International Conference on Ultrafast Phenomena and as associate editor of several IEEE and OSA journals. He has also served as Secretary/Treasurer of IEEE LEOS and as a Vice-President of the International Commission on Optics (ICO). Professor Weiner is a Fellow both of the IEEE and the Optical Society of America and has won numerous awards for his research.

To arrange a meeting with the speaker, please contact Dr. Weiner's host, Dr. Carmen Menoni, Electrical and Computer Engineering Department, at (970)491-8659 or menoni@engr.colostate.edu

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