**Title**: Advanced Light Management: From Nano to Macro

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**Abstract**: Optical cavities, which consist of an optically transparent medium with wavelength-scale thickness, have been widely used in a wide variety of areas ranging from lasers and sensors to filters. In this talk, I will present angle invariant structural color filters with high color purity exploiting optical nanocavities featuring strong resonance behaviors in highly absorbing media with the ultrathin cavity thickness as compared to the wavelength of incident light, which is distinctly different from conventional optical cavity systems. I will also introduce a new photovoltaic (PV) scheme integrating novel optical design and electrical design to create colored semitransparent PV cells that can be harmoniously incorporated with building envelops such as facades, walls and windows. In addition, a nanoporous coating, formed using optimized chemistries and self-assembly processes, offers ~98% transmission efficiency with negligible scattering loss over the full solar spectrum with wavelengths from 350 nm to 1500 nm, and its application to anti-reflection surfaces for concentrated PV (CPV) with enhanced efficiency, will be described. Lastly, a module architecture that integrates capabilities in flat plate PV directly with one of the most sophisticated CPV technologies, for capture of both direct and diffuse sunlight, thereby achieving unmatched efficiency in PV conversion of the global solar radiation, will be introduced. The presented schemes could be easily applicable to other wavelength and material systems, thus opening door to numerous applications, such as energy-efficient ultrathin colored display technologies, decorative building-integrated PV and ultra-high efficiency hybrid PV.