



*Prof. Frederico Capasso*  
*Harvard University*

## NANOSCIENCE COLLOQUIUM

Thursday  
June 2, 2016  
at 15:15,  
Rydberg lecture Hall,  
Fysicum

### **Metasurfaces for Wavefront Shaping: High-performance Planar Photonic Components beyond Refractive and Diffractive Optics**

The design of fundamental optical components such as lenses, gratings, and holograms has remained essentially unchanged for at least fifty years, relying on textbook refractive and diffractive optics. Subwavelength structured surfaces known as metasurfaces are leading to a fundamental reassessment of such designs with the emergence of optical components that circumvent the limitations of standard ones and with entirely new functionalities such as the ability to shape wavefronts in unprecedented ways. Our formulation of the generalized laws of reflection and refraction for metasurfaces has led us recently to demonstrate ultrathin visible and near-IR dielectric metalenses with diffraction limited focusing that can correct monochromatic and chromatic aberrations without using composite lenses. Using a novel Titanium Oxide atomic layer deposition process along with designs based on the Berry phase we have fabricated high numerical aperture lenses in the red, green and blue which outperform state-of-the-art objectives as well as new lenses for chiral imaging. I will also discuss axicons with wavelength independent focusing, broadband high efficiency holograms in the visible and spin-to-orbital angular momentum converters which create complex helical beams. I will conclude by presenting a new approach to polarimetry based on scattering from a single metasurface that has allowed us to measure the Stokes parameters of a light beam, matching the performance of existing state-of-the-art bulky polarimeters.

**Host: Lars Samuelson (Solid State Physics)**