Abstract: Understanding optical properties of materials at the nanoscale level is critical for multitude of applications including solar energy harvesting, photocatalysis and sensing as well as for discovery of emergent material functionalities. Near-field microscopy maps optical and chemical properties at the ultimate source of electromagnetic radiation with spatial resolution far beyond the diffraction limit of light. In this presentation, near-field images of fundamental optical modes of sub-100 nm plasmonic nanostructures will be presented and discussed. The near-field localization in optical gap nanoantennas is directly visualized in real space with 10 nm spatial resolution (the highest resolution ever reported), mapping the amplitude and phase characteristics of the in-plane and out-of-plane vector components selectively. The direct observation of the orientation dependent optical response of chemically synthesized gold nanorods will be discussed, comparing the selective plasmon mode excitations by incident laser light and by local field. I will also present our progress toward accurate integration of nanomaterials using self-assembly procedures.

Bio: Dr. Habteyes received his B.S. and M.S. degrees in Chemistry from Addis Ababa University in 1997 and 2000, and his Ph.D. in Chemistry from the University of Arizona in 2008 working with Prof. Andrei Sanov. He was a postdoctoral fellow at the University of California at Berkeley and Lawrence Berkeley National Laboratory from 2008 to 2012 working with Prof. Stephen Leone and Prof. Paul Alivisatos. He started his assistant professor position at the University of New Mexico in August 2012. His research interest includes development and application of near-field optical microscopy, energy transfer in integrated nanomaterials, plasmon enhanced photocatalysis and organic solar cells.