Recent theory predicted a new class of meta structures made of engineered subwavelength entities - meta “atoms” and “molecules” which enable the unprecedented optical properties that do not exist in the nature such as optical magnetism and negative refraction. Especially, the predicted superlens made of metamaterials overcomes the diffraction limit, which may have profound impact in wide range of applications such as nano-scale imaging, nanolithography, and ultra-density data storage.

I’ll discuss a few recent experiments that demonstrated these intriguing physics. I will describe how to create the first bulk optical metamaterials that show the negative refraction, followed by superlens and optical cloaking: two most striking phenomena in metamaterials. I will further discuss a new technology based on superlens for nano-scale lithography that may transform the next generation of nano-manufacturing, along with our recent demonstration of plasmon lasers.