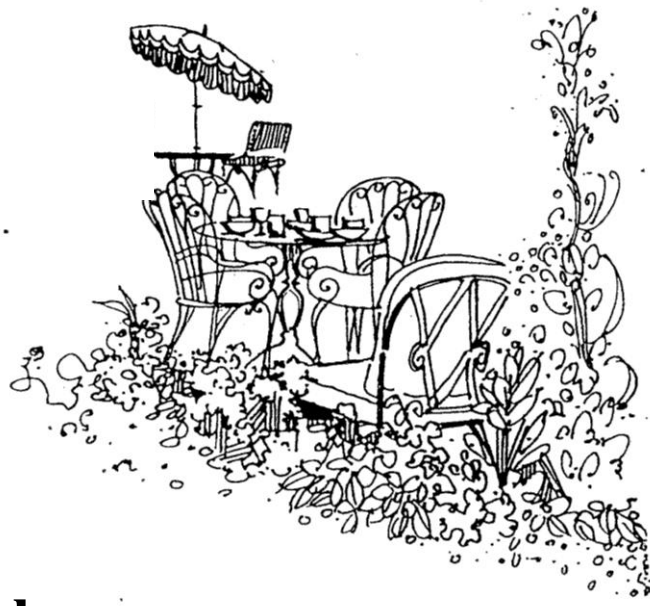
Chez Pierre

Presents ...

Monday, September 30, 2013
12:00pm
MIT Room 4-331



Steven G. Johnson
Massachusetts Institute of Technology

"Poking Holes in the Invisibility Cloak"

The idea of invisibility cloaks, from Harry Potter to Star Trek, has long captured the public imagination, and this excitement has recently spilled into the scientific arena with intriguing mathematical proposals by Pendry and others of theoretical conditions for true "cloaking" materials. However, despite the progress in this area, it has become increasingly clear that prospects of true invisibility suffer from inherent challenges that rapidly worsen as more and more realism is introduced. In this talk, I will review the ideas of transformation optics and metamaterials that underlie these invisibility proposals, along with recent progress in theory and experiments, assuming no specialized background in optics. Starting with the simple notion that it is difficult to reconcile requirements of long time delays and low losses, and working my way to techniques using the optical theorem to relate bandwidth requirements to complex-frequency scattering problems, I describe several related scaling limitations of invisibility: the problem becomes harder as the object to be cloaked becomes larger. Future work on invisibility at practical scales may need to focus on relaxations of the cloaking problem, which impose limitations on the observer in order to circumvent the inherent difficulty of true invisibility.