# Cloaking: a new phenomena in Electromagnetism and Elasticity

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## Resumen

The making of an object invisible through some cloaking device until recently was commonly regarded as science fiction. Two quite different types of electromagnetic cloaking were proposed in early 2006. In our cloaking scenario a collection of finitely many polarizable dipoles becomes essentially invisible when they are within a certain critical distance of a superlens.

Superlenses have attracted attention because they promise resolution on a length scale finer than can be achieved using conventional lenses, i.e. finer than the wavelength. The radiation scattered by the polarizable dipoles resonates with the superlens and acts back on the dipoles to essentially cancel the field incident on them, which is why they become invisible. Dipolar energy sources supplying constant power also become invisible. A second type of cloaking was proposed by Pendry, Schurig and Smith and Leonhardt. In this scenario a shield cloaks objects to incident electromagnetic waves by guiding the waves around the object.

This work is related to the earlier work of Greenleaf, Lassas and Uhlmann, on cloaking for conductivity. Here we will review these developments and also discuss how cloaking might be extended to elasticity us- ing these ideas. This requires new materials, in particular materials with anisotropic mass density and a constitutive law in which the stress depends on the velocity and the momentum depends on the displacement gradient. We sketch how such materials, with behavior outside that of continuum elastodynamics, might be made. This is joint work with Lindsay Botten, Marc Briane, Ross McPhedran, Nicolae Nicorovici, and John Willis.