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**Metamaterials, Transformation Optics, and the Science of Invisibility**

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Refractive materials give limited control of light: we can fashion lenses, and construct waveguides, but complete control is beyond simple refracting materials. Ideally we might wish to channel and direct light as we please as if diverting the flow of a fluid. Manipulation of Maxwell's equation using transformation optics shows that we can achieve just that, and metamaterials open the door to this new design paradigm for optics, providing the properties required to give almost complete control of light down to sub wavelength scales. One potential application would be to steer light around a hidden region, creating a cloak of invisibility.