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Sommario/riassunto

Light is in a sense "one-handed" when interacting with atoms of conventional materials. This is because out of the two field components of light, electric and magnetic, only the electric "hand" efficiently probes the atoms of a material, whereas the magnetic component remains relatively unused because the interaction of atoms with the magnetic field component of light is normally weak. Metamaterials, i.e. artificial materials with rationally designed properties, can enable the coupling of both of the field components of light to meta-atoms, enabling entirely new optical properties and exciting applications with such "two-handed" light. Among the fascinating properties is a negative refractive index. The refractive index is one of the most fundamental characteristics of light propagation in materials. Metamaterials with negative refraction may lead to the development of a superlens capable of imaging objects and their fine structures that are much smaller than the wavelength of light. Other exciting applications of metamaterials include novel antennae with superior properties, optical nano-lithography and nano-circuits, and "meta-coatings" that can make objects invisible. The word "meta" means "beyond" in Greek, and in this sense the name "metamaterials" refers to "beyond conventional materials". Metamaterials are typically man-made and have properties not available in nature. What is so magical about this simple merging of "meta" and "materials" that has attracted so much attention from researchers and has resulted in exponential growth in the number of publications in this area? The answer you can find in this book.