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Transforming Light with Metamaterials

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Metamaterials are expected to open a gateway to unprecedented electromagnetic properties and functionality unattainable from naturally occurring materials, thus enabling a family of new "meta-devices." We review this new emerging field and significant progress in developing metamaterials for the optical part of the spectrum. Specifically, we describe recently demonstrated artificial magnetism across the whole visible, negative-index in the optical range, and promising approaches along with challenges in realizing optical cloaking. A new paradigm of engineering space for light with transformation optics will be also discussed.