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**Metamaterials: What They Are and How They Work**

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Metamaterials are loosely defined as artificial materials engineered to have unusual properties not found in nature. Since these properties predominantly relate to the propagation of waves through the material, metamaterial engineering has a broad range of applications including photonics, acoustics and mechanical vibrations, thermal radiation and heat transfer, and even material transport (fluids). This talk presents a broad overview of these applications, and discusses the underlying physics using microwave photonic crystals as a specific example.