In this talk, I discuss our recent research activity in electromagnetics, nano-optics and acoustics, showing how tailored meta-atoms and suitable arrangements of them open exciting venues to realize non-reciprocal devices for light, radio-waves and sound, largely breaking Lorentz reciprocity and realize isolation without the need of a magnetic bias. Our approaches are based on using suitably tailored mechanical motion, spatio-temporal modulation, and nonlinearities in coupled resonator systems, and have enabled magnet-free circulators and isolators for sound, microwaves, THz and optical frequencies, non-reciprocal antennas, emitters and absorbers breaking Kirchhoff’s law, self-induced isolation for high-intensities triggered by nonlinearities, and a new generation of non-reciprocal topological insulators for light, sound, and static systems in mechanics. In the talk, I will also discuss the impact of these concepts from basic science to practical technology, and some of their inherent limitations stemming from thermodynamics, specifically in the context of nonlinear isolators and of the delay-bandwidth limit.