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Flat and conformal optics with dielectric metasurfaces

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Flat optical devices based on lithographically patterned sub-wavelength dielectric nano-structures provide precise control over optical wavefronts, and thus promise to revolutionize the field of free-space optics. I discuss our work on metasurfaces composed of high-index nano-posts supported by transparent substrates. Complete control of both phase and polarization is achieved at the level of single nano-post. Using this nano-post platform, we demonstrate lenses, waveplates, polarizers, arbitrary beam splitters and holograms. Devices providing multiple functionalities, like simultaneous polarization beam splitting and focusing are implemented. By embedding the metasurfaces in flexible substrates, conformal optical devices that decouple the geometrical shape and optical function are shown. Multiple flat optical elements are integrated in optical systems such as planar retro-reflectors and Fourier lens systems with applications in ultra-compact imaging systems.