OFERTA DE CONTRATO "FPI 2019"
del Ministerio de Ciencia, Universidades e Innovación

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TÍTULO TESIS
OPTICAL METASURFACES IN NANOPHOTONICS: Bound states in the continuum and Topologically protected states *Asociado al proyecto (recién concedido):* ***Magneto-Electric-Light Optics in all DIelectric nanostructured mediA (MELODIA)***
ESPECIALIDAD
FÍSICA o INGENIERÍA DE TELECOMUNICACIONES
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MEMORIA DEL PROYECTO DE TESIS DOCTORAL

High-refractive-index dielectrics and semiconductors are known to provide a wealth of phenomena stemming from both passive and active optical properties, which are enhanced/reshaped on resonant nanostructures, making them specially interesting at the nanoscale. Thus semiconducting nanostructures, either on their own or combined with metals, may exhibit a rich phenomenology (see Figure below with some of our recent works), with many expected applications in Nano-Photonics, such as nanoantenas, nanolasers, highly-efficient metasurfaces, planar nano-Optics, and molecular (bio)sensors.

The major aim of this thesis project is to investigate theoretically the electromagnetic properties of resonant semiconducting nanostructures. Special emphasis will be given to the fundamental aspects of a variety of light-matter interaction properties, in connection with the behavior of dielectric nanostructures as optical nanoresonators. Specifically, the main objective is to investigate high-index dielectric nanostructures exhibiting strong magnetic-dipole resonances (called Magnetic Light), arranged in periodic planar arrays (called metasurfaces and metadevices), to explore their rich phenomenology: e.g. Fano resonances, bound states in the continuum, and topological insulators.

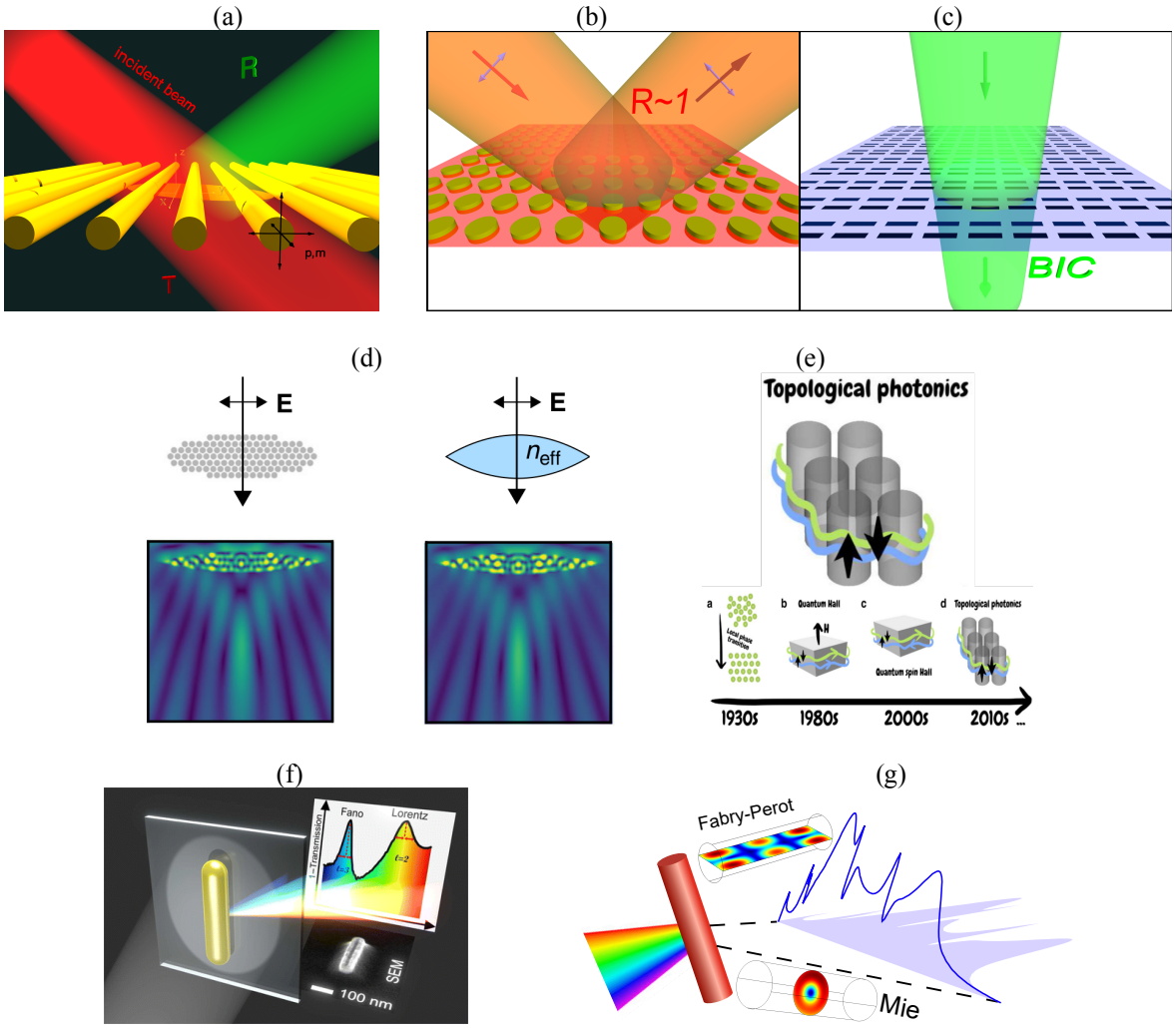

Figure: (a) Generalized Brewster effects in Si-nanocylinder metasurfaces (Opt. Express 2018). (b,c) Bound states in the continuum in high-refractive-index disk & rod dimer metasurfaces (ArXiv:1902.07148, ArXiv:1901.03122). (d) Extraordinarily transparent compact metallic metamaterials (Nat. Commun. 2019) & (e) Topological Photonics review (J. Appl. Phys. 2019). (f,g) Fano resonances in Au and Si nanowires, respectively (Nano Lett. 2015, ACS Photon. 2017).

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