

## PhD Fellowship “FPI 2019” (Ministerio de Ciencia, Universidades e Innovación)

### OPTICAL METASURFACES IN NANOPHOTONICS:

#### Bound states in the continuum and Topologically protected states

(project PGC2018-095777-B-C2, Magneto-Electric-Light Optics in all Dielectric nanostructured media, MELODIA)

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 nanoantennas, 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.

**Further info (in Spanish):** [Convocatoria contratos predoctorales \(MICIU\)](#).

**Call open for applications** from October 17 to November 7 (2019) on the webpage (<https://sede.micinn.gob.es/>).

**Requirements:** eligible candidates are students with a good academic record and strong motivation for research, with a M.S. degree in Physics, Electrical Engineering, or related, earned prior to the end of the evaluation (expected May 2020).

**Contacts:** José A. Sánchez Gil ([j.sanchez@csic.es](mailto:j.sanchez@csic.es)), Vincenzo Giannini ([v.giannini@csic.es](mailto:v.giannini@csic.es)).

<http://www.iem.cfmac.csic.es/evpm/jasgmnews.htm>, <https://www.gianninilab.com/>

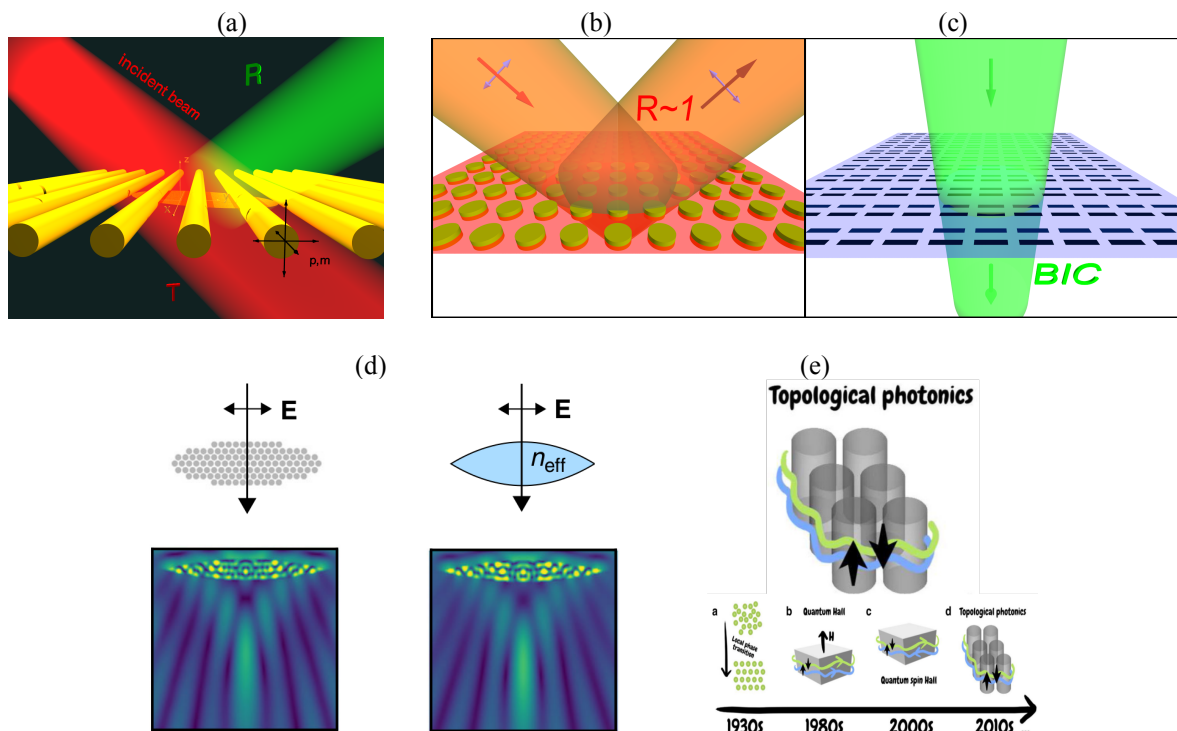


Figure: (a) Generalized Brewster effects in Si-nanocylinder metasurfaces (Opt. Express 2018). (b,c) Bound states in the continuum in high-refractive-index disk & rod dimer metasurfaces (Sci. Rep. 2019, Optica 2019). (d) Extraordinarily transparent compact metallic metamaterials (Nat. Commun. 2019) & (e) Topological Photonics review (J. Appl. Phys. 2019).