



ITMO UNIVERSITY

Saint Petersburg, Russia



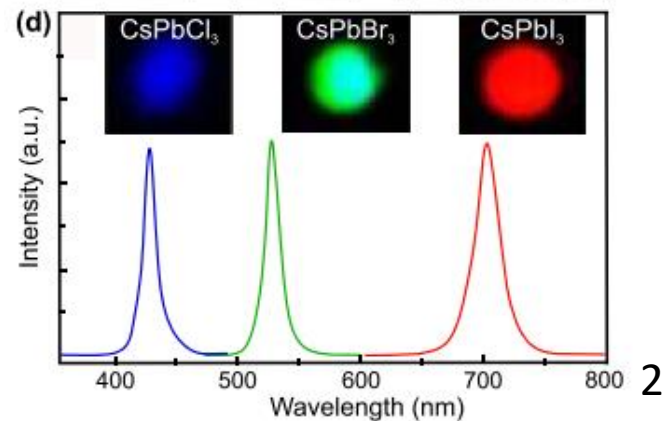
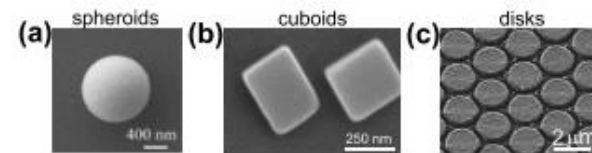
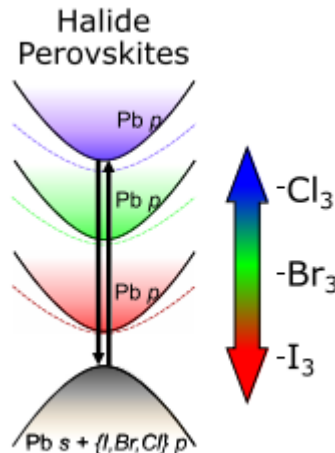
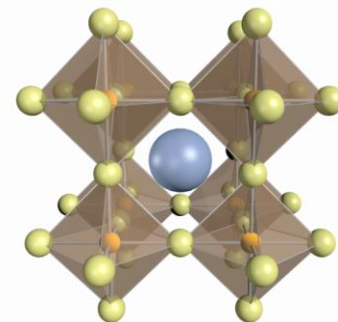
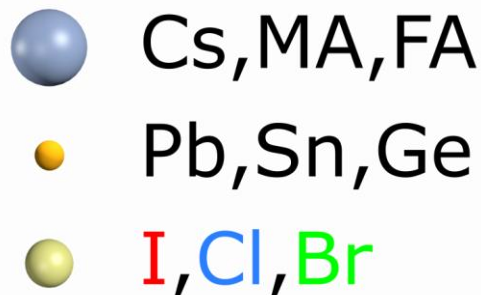
Topological nanostructures with halide perovskites

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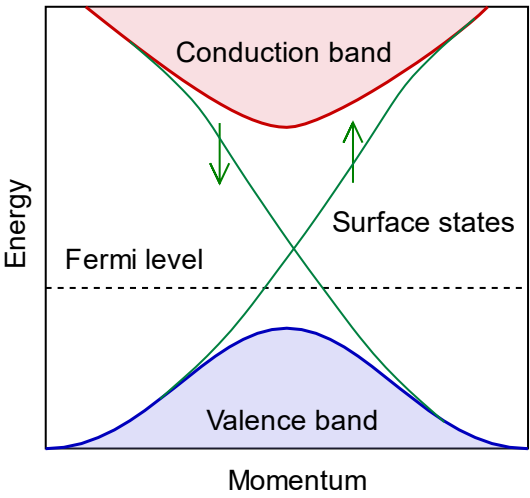
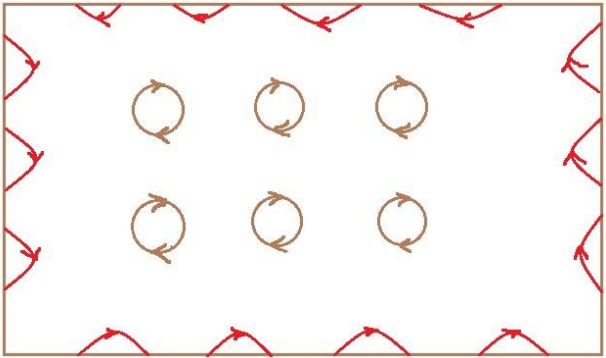
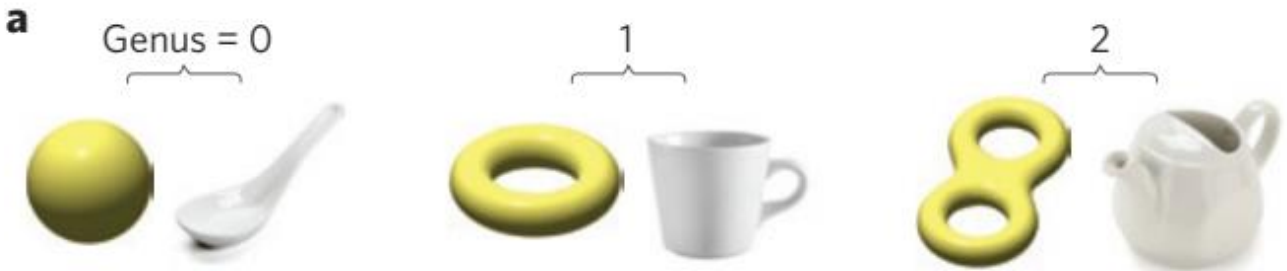
METANANO 2020

Halide perovskites

- Simple fabrication
- Easy processing
- High refractive index ($n = 2-3$)
- Chemically tunable bandgap
- Strong optical nonlinear response
- High defect tolerance

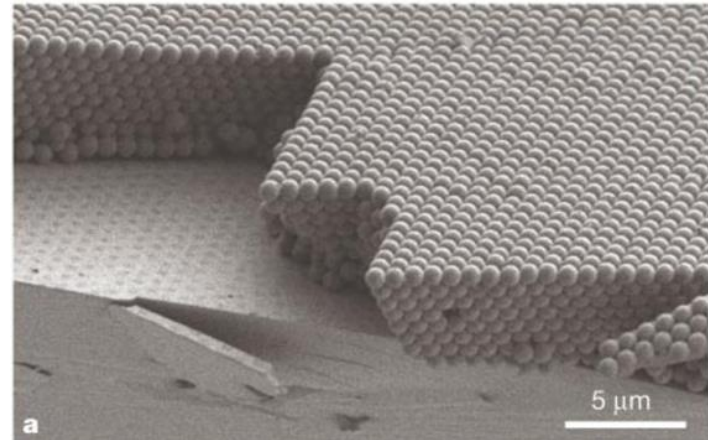
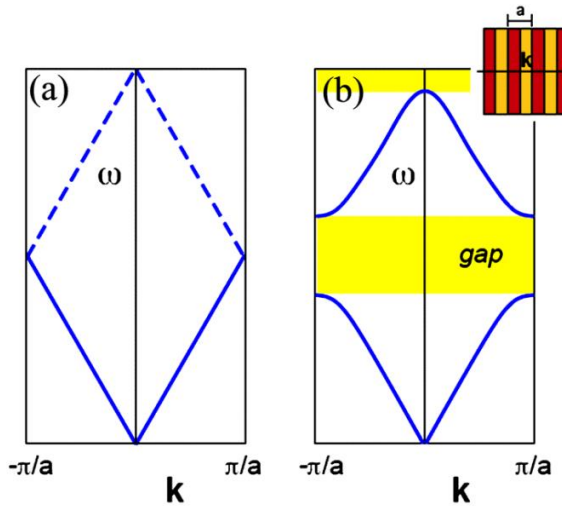
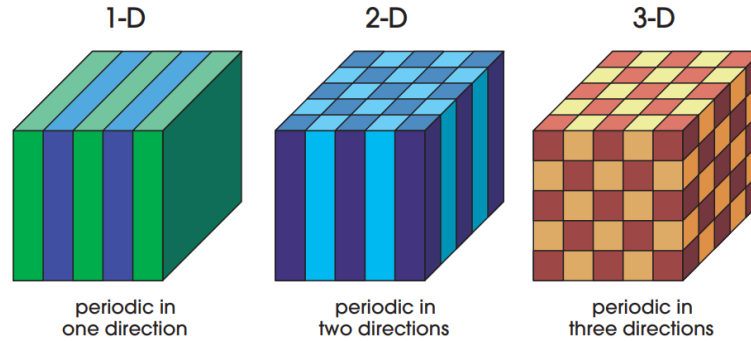


Topology and topological insulators



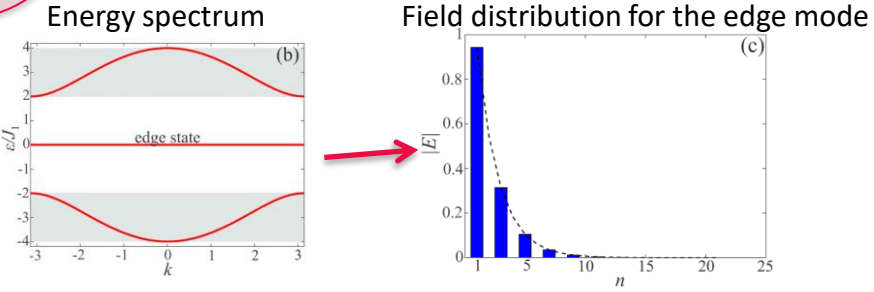
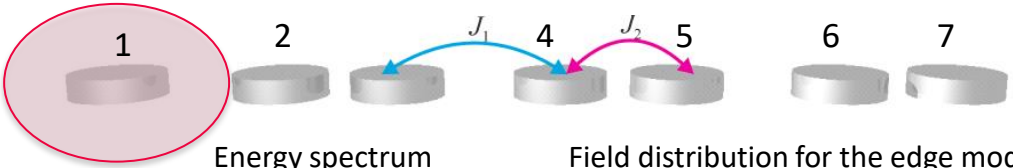
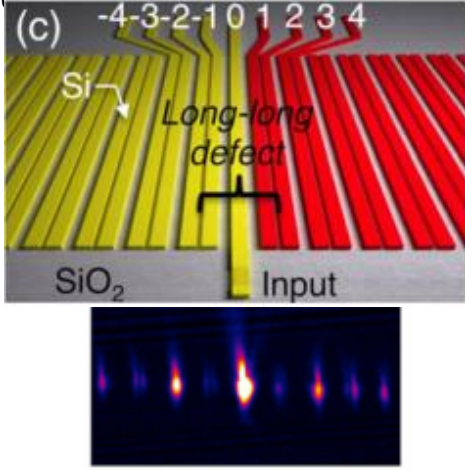
Photonic crystals

Periodically stacking materials with different dielectric or magnetic properties to the “infinite” structure



Topological models

- Su-Schrieffer-Heeger model

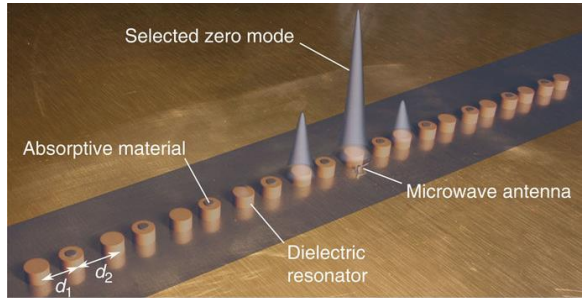


Su, Schrieffer, Heeger. Physical Review Letters, **42** (25), P. 1698–1701 (1979)

Realized in electronic, photonic, plasmonic, polaritonic and mechanical systems

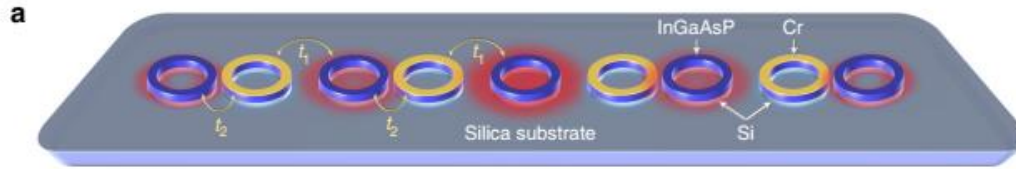
Experimental observation:

- [1] N. Malkova, *et al.* Optics Letters, vol. 34, 1633 (2009).
- [2] Sinev, *et al.* Nanoscale 7, 11904 (2015).
- [3] Blanco-Redondo, *et al.* Phys. Rev. Lett. 116, 163901 (2016).

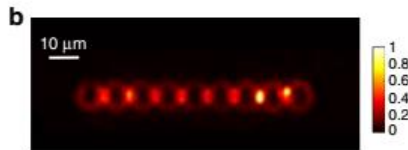
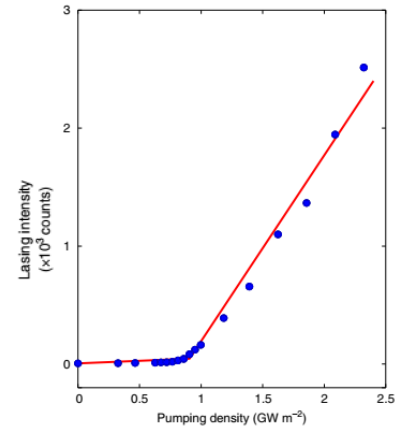
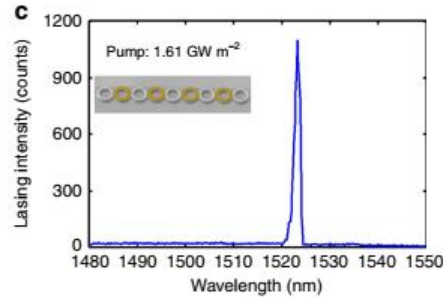
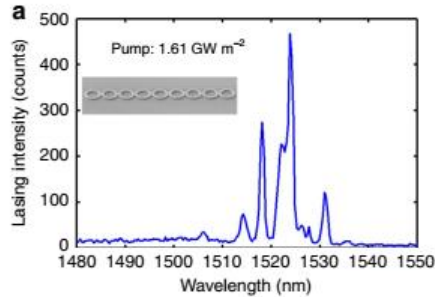


Topological hybrid silicon microlasers

Non-Hermitian variant of the paradigmatic Su-Schrieffer-Heeger (SSH) model



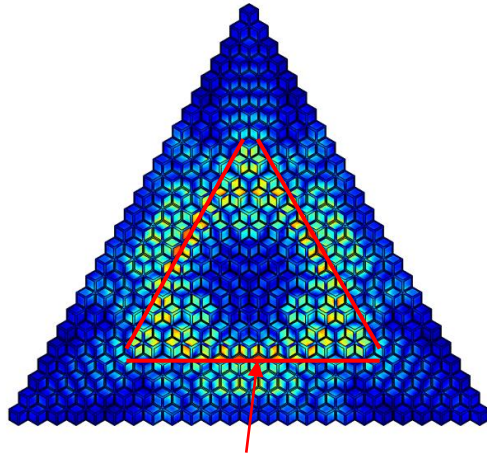
The coupling profile is precisely controlled by the separations between adjacent rings



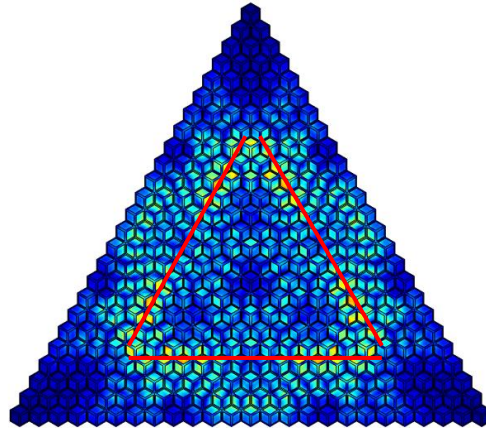
Silicon Kagome lattice with perovskite QDs

Thickness: 70 nm + 20nm layer (n=2.5)

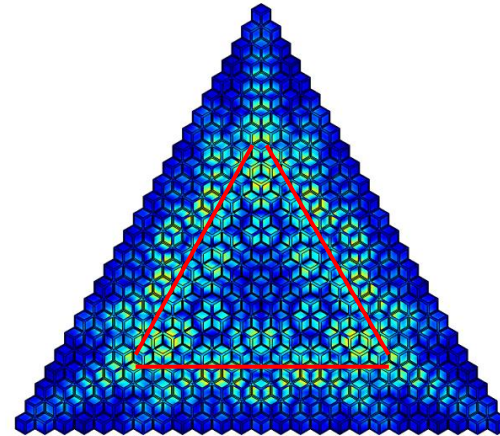
708 nm
Q = 22



705 nm
Q = 21



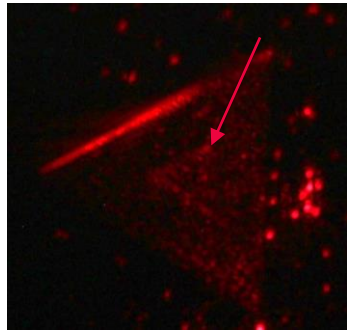
701 nm
Q = 30



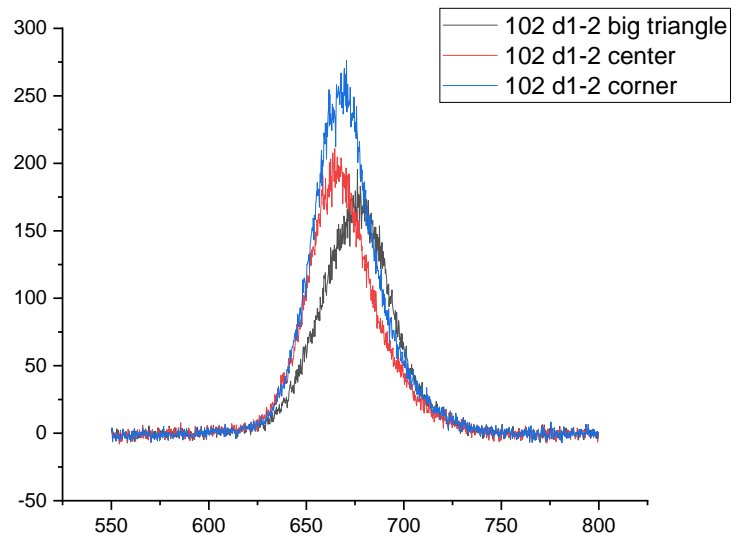
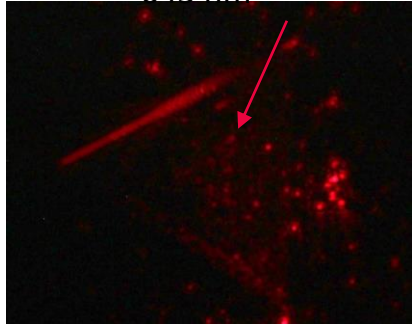
13 ячеек

Darkfield scattering

635 nm



645 nm



625 nm

620 nm

615 nm

Thank you for your attention!

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