Chez Pierre

Presents ...

Monday, April 11, 2022

12:00pm Noon

Duboc Room 4-331

Chez Pierre Seminar

Bo Zhen, University of Pennsylvania

"Nonlinear topological photonics"

Topological photonics is a rapid developing field, drawing inspirations from the recent successes in electronic systems. Yet, there are two major differences between photons and electrons: (1) photons obey Maxwell's equations, which permit nonlinearities, whereas the Schrodinger equation is always linear; (2) photons are bosons, which allows one to probe responses at virtually any desired energy (frequency) without the limitation of the Fermi energy as in electrons. Based on these differences, I will present our recent theoretical and experimental results in exploring the role of optical nonlinearity in topological physics. On the theory side, these include defining topological invariants in driven nonlinear photonic crystals [1] and identifying various topological phases, such as the Floquet Chern insulators [1], dipole phases [2], and quadrupole phases [3,4]. On the experiment side, I will present our recent results towards observing Floquet Chern insulators, protecting out-of-plane photon radiation losses using topology [5] and their applications as grating couplers [6]. Finally, I will present an outlook for potential opportunities in science and technology such as night-vision goggles.

References:

[1] Nature Communications 10, 4194 (2019)
[2] Physical Review Letters 126, 113901 (2021)
[3] Nature Communications 11, 3119 (2020)
[4] arXiv:2103.01198
[5] Nature 574, 501 (2019)
[6] Nature 580, 467 (2020)