

Séminaire

Mercredi 27 septembre

14h30

Mezzanine D2

Oded ZILBERBERG

"Topological pumps and topological quasicrystals"

Résumé:

Topological phases of matter have fascinated researchers since over 30 years. Indeed, last year's Nobel prize joins the previous two awards for the quantum Hall effect in commending this unique field. In my talk, I will start with the quantum Hall effect and demonstrate how it is related to topological pumps. Using Laughlin's argument, we shall see how such pumps are best understood in the context of time-dependent electronic (fermionic) systems. I will, then, present our realizations of topological pumps using two completely different bosonic systems, namely, using coupled photonic waveguide arrays and with trapped atoms in optical superlattices. In the second part of my talk, I will detail the connection between quasicrystals and topological pumps. In this context, we have found that quasicrystals inherit topological attributes

from their corresponding pumps, i.e., quasicrystals are characterized with topological indices from dimensions higher than their own. I will discuss several 1D quasi-periodic models with nontrivial 1st Chern numbers and topological boundary states, which are inherited from the 2D quantum Hall effect. This topological classification leads to several interesting physical implications. Last, I will present how this naturally leads to realizing the 4D quantum Hall effect and 2D topological pumps in the lab.