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CV/ biography

Jacqueline Bloch is a CNRS Research Director, Professor lecturer at Ecole Polytechnique and member of the French Academy of Science.

She is an experimentalist, expert in the physics of light-matter interaction in semiconductors, non-linear and quantum optics. After a PhD on semiconductor quantum wires, she started studying hybrid exciton-photon quasi-particles in semiconductor microcavities (cavity polaritons). This photonic platform also referred today to as Quantum Fluids of Light has allowed her group to explore diverse physical phenomena from Bose Einstein condensation, superfluidity, dissipative phase transition to analog gravity. Her group has made ground-breaking contributions in the emulation of linear andnon-linear Hamiltonians, and the exploration of flat band physics, Dirac and topological physics. Jacqueline Bloch's research is fundamental but can also lead to new concepts for innovative optical components.

She has received numerous awards including the 2015 Jean Ricard Prize from the French Physical Society, the 2017 CNRS Silver Medal and the 2019 Ampère Prize from the French Academy of Sciences.

Emulating condensed matter with Quantum fluids of light

Photonic resonators, coupled within a lattice, have appeared in the recent years as a powerful synthetic platform to imprint on light some of the fascinating physical properties that can emerge in condensed matter, or even to go beyond what exists in nature. For instance, light can become superfluid, present spin orbit coupling, spin Hall effect or propagate along topologically protected edge states. New physical properties may emerge when drive and dissipation come into play. Such realizations are not only interesting from a fundamental point of view, but also inspire innovative photonic devices.

After a general introduction to the field of quantum simulation with light, I will present some recent experiments performed at C2N. Using lattices of semiconductor microcavities, we explore single and many body physics of photons in 1D or 2D lattices and the emergence of novel physics related to the openness of the system. Interestingly our photonic platform also enables exploring universal scaling related to the Kardar–Parisi–Zhang universality class.

Keywords: Cavity polaritons ; Semiconductor microcavities ; Bose Einstein condensates ; Dirac physics ; Topology