Special Chez Pierre Seminar

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"Emergent honeycomb physics from chiral atomic orbitals on a triangular lattice”.

In the hunt for room-temperature quantum spin Hall insulators, bismuthene [1] has demonstrated the impressive advantage of a local spin-orbit coupling experienced by the in-plane p-orbitals. This alternative to pi-bond graphene can be pushed to a conceptually even more essential level upon halving the honeycomb lattice, i.e. considering chiral p-orbitals on a triangular lattice [2]. Here, we theoretically conceive and experimentally realize for the first time a triangular QSHI, "indenene", an indium monolayer exhibiting non-trivial valley physics and large gap. We identify an interference mechanism of the Bloch functions and the emergence of a hidden honeycomb pattern in the charge localization, which makes the topological classification accessible to bulk experiments, without the necessity of quantum edge transport.