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Crystalline symmetry in topological quantum states of ultracold atoms

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Symmetry plays a fundamental role in topological quantum states. In this talk, I will discuss practical schemes for exploring the interplay between crystalline symmetries and topology in ultracold atoms. In optical lattices with nonsymmorphic symmetries, nonsymmorphic Chern insulators arise. A variety of new phenomena, such as band structures resembling Mobius strips, quantum dynamics controlled by non-abelian Berry connections, and nonsymmorphic topological pumping, can be naturally accessed in laboratories.