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Beyond Artifcial Graphene with Ultracold Fermions in a Tunable-Geometry Optical Lattice REMI DESBUQUOIS, GREGOR JOTZU, MICHAEL MESSER, THOMAS UEHLINGER, DANIEL GREIF, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland — Ultracold fermions in optical lattices offer the possibility to simulate the behavior of solids and explore regimes, which are not accessible in current materials. We have created an articifal graphene-like system and study how it can be driven from the usual Dirac-metal state to various insulating states (including the first implementation of a 2D Mott-insulator of fermions) by changing interactions, on-site energies or the tunneling structure. We present recent results on the behavior of static and dynamic observables in insulating regimes.

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