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A sheet of graphene - quantum fields in a discrete curved space

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Optical lattices or crystalline materials like graphene offer a fascinating laboratory for studying and simulating the impact of non-trivial geometries (e.g. curved graphene sheets) on the quantum fields living in it. Despite existing analogies between effects like deformations and defects in the lattice systems and curvature and torsion in the differential geometry approach, the correspondence is still incomplete and the language allowing for effective calculations is still lacking. We report on progress in this direction and new experimental possibilities.