# ON THE MATHEMATICAL THEORY OF GRAPHENE AND ITS ARTIFICIAL ANALOGUES

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Graphene is a two-dimensional material made up of a single atomic layer of carbon atoms arranged in honeycomb pattern. Many of its remarkable electronic properties, e.g. quasi-particles (wave-packets) that propagate as massless relativistic particles and topologically protected edge states, are closely related to the spectral properties of the underlying single-electron Hamiltonian: $-\Delta + V(x)$, where $V(x)$ is a potential with the symmetries of a hexagonal tiling of the plane. Taking inspiration from graphene, there has been a great deal of activity in the fundamental and applied physics communities related to the properties of waves (photonic, acoustic, elastic, ...) in media whose material properties have honeycomb symmetry. In this talk I will discuss some of the mathematical theory.