MATHEMATICS OF MAGIC ANGLES FOR BILAYER GRAPHENE

MACIEJ ZWORSKI

Magic angles are a hot topic in condensed matter physics: when two sheets of graphene are twisted by those angles the resulting material is superconducting. Please do not be scared by the physics though: I will present a very simple operator whose spectral properties are thought to determine which angles are magical. It comes from a recent PR Letter by Tarnopolsky–Kruchkov–Vishwanath. The mathematics behind this is an elementary blend of representation theory (of the Heisenberg group in characteristic three), Jacobi theta functions and spectral instability of non-self-adjoint operators (involving Hörmander's bracket condition in a very simple setting). The results will be illustrated by colourful numerics which suggest some open problems. The talk is based on a "summer relaxation project" with S. Becker, M. Embree and J. Wittsten.