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The magic of atomically thin crystals

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The discovery of two dimensional (2D) atomically thin crystals has changed the way we think about materials. Because all the atoms in any 2D crystal are exposed to our three-dimensional world, it has become possible for the first time to tune the electronic properties of a material without changing its chemical composition, for example by introducing strain, plucking out atoms, orintentionally stacking of 2D crystals in various ways. One of the simplest techniques, changing the relative orientation of superposed 2D crystals, has proven to be especially impactful and has taken center stage recently following the surprising discovery of interaction induced insulating states and superconductivity in twisted bilayer graphene. In this talk I will discuss this rapidly evolving field from its serendipitous discovery to recent developments.

1.Observation of Van Hove singularities in twisted graphene layers,G. Li, et al , Nature Phys. 6 (2010) 109

2.Tuning a Circular p-n Junction in Graphene from Quantum Confinement to Optical Guiding, Y. Jiang, et al,Nature Nanotechnology 12 (2017) 1045

3.Inducing Kondo screening at point defects in graphene with gating and local curvature, Y. Jiang, et al , Nature Comm. 9 (2018) 2349

4.Charge-ordering and broken rotational symmetry in magic angle twisted bilayer graphene, Y. Jiang,et al, Nature, 573 (2019) 91.

5. Evidence of Flat Bands and Correlated States in Buckled Graphene Superlattices, J. Mao,et al arXiv:2006.01660, Nature in print (2020)