Topological Superconductivity in Twisted Multilayer Graphene

Mostly based on:
*Xu & Balents, Phys. Rev. Lett. **121**, 087001*

Team 2

Xuchen **Cao**, Alejandro ***Cárdenas-Avendaño*** & *Patrick* ***Carzon***

ILLINOIS

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PHYS 596

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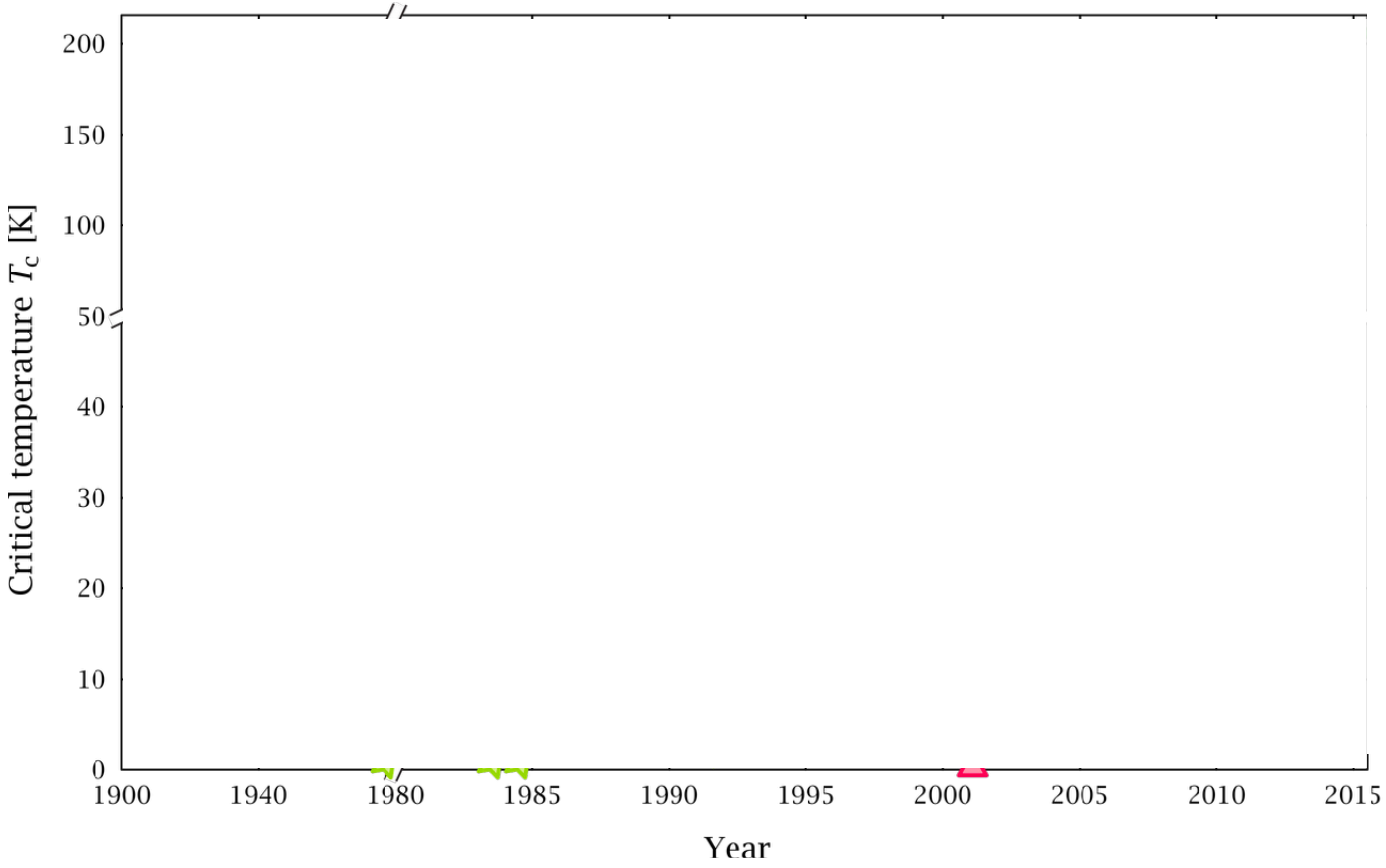

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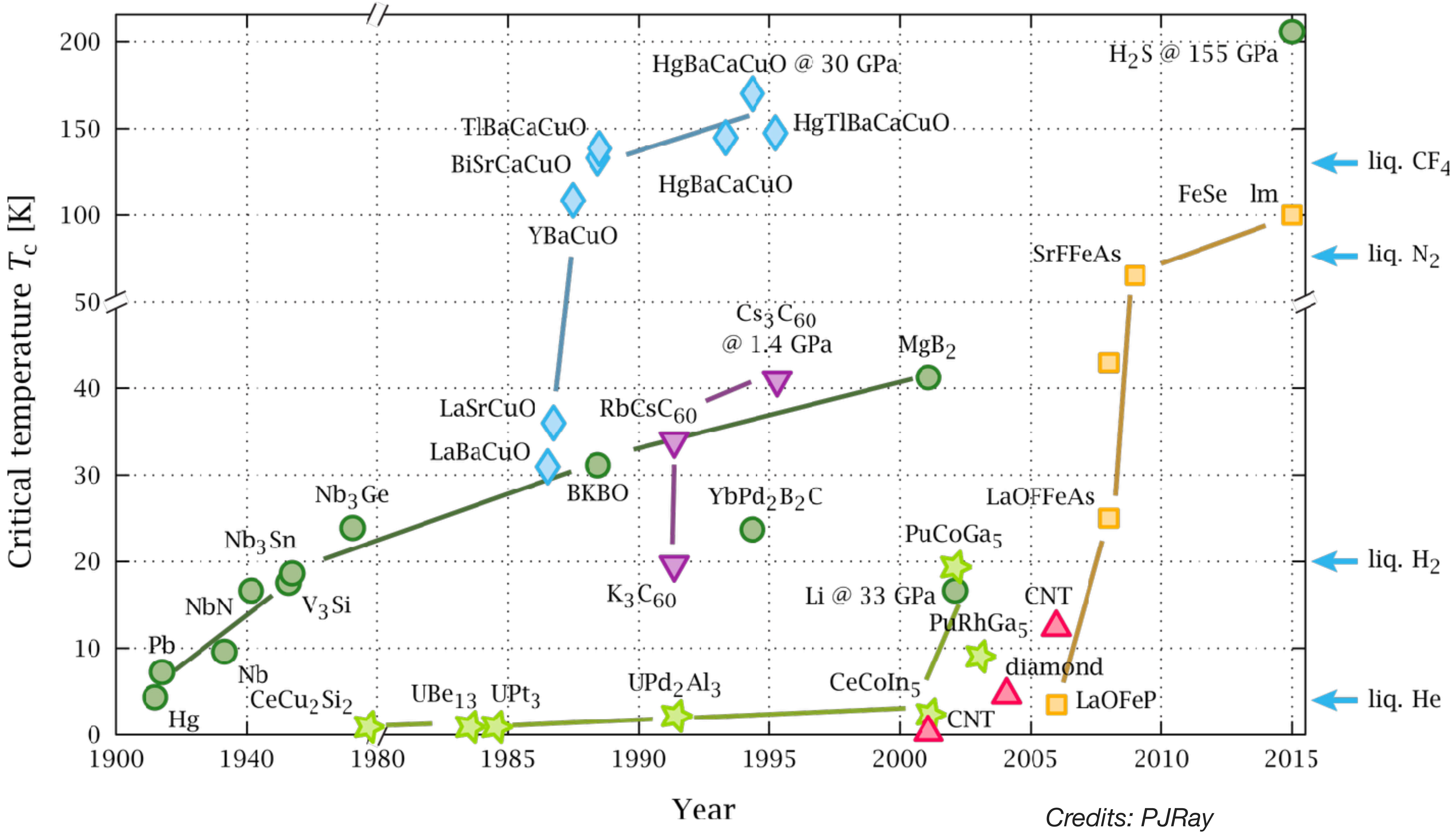
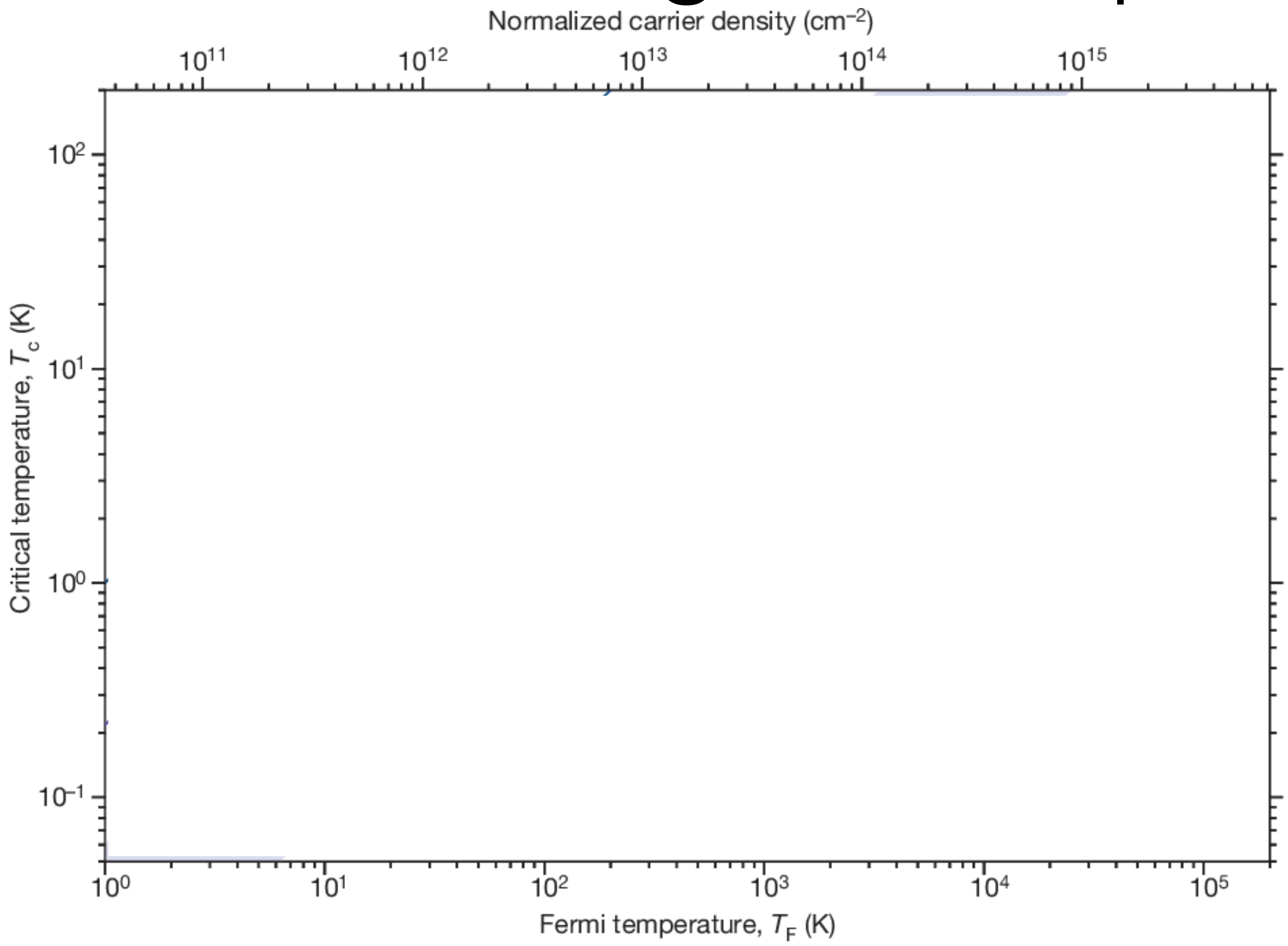


Credits: PJRay

How "strong" is a superconductor



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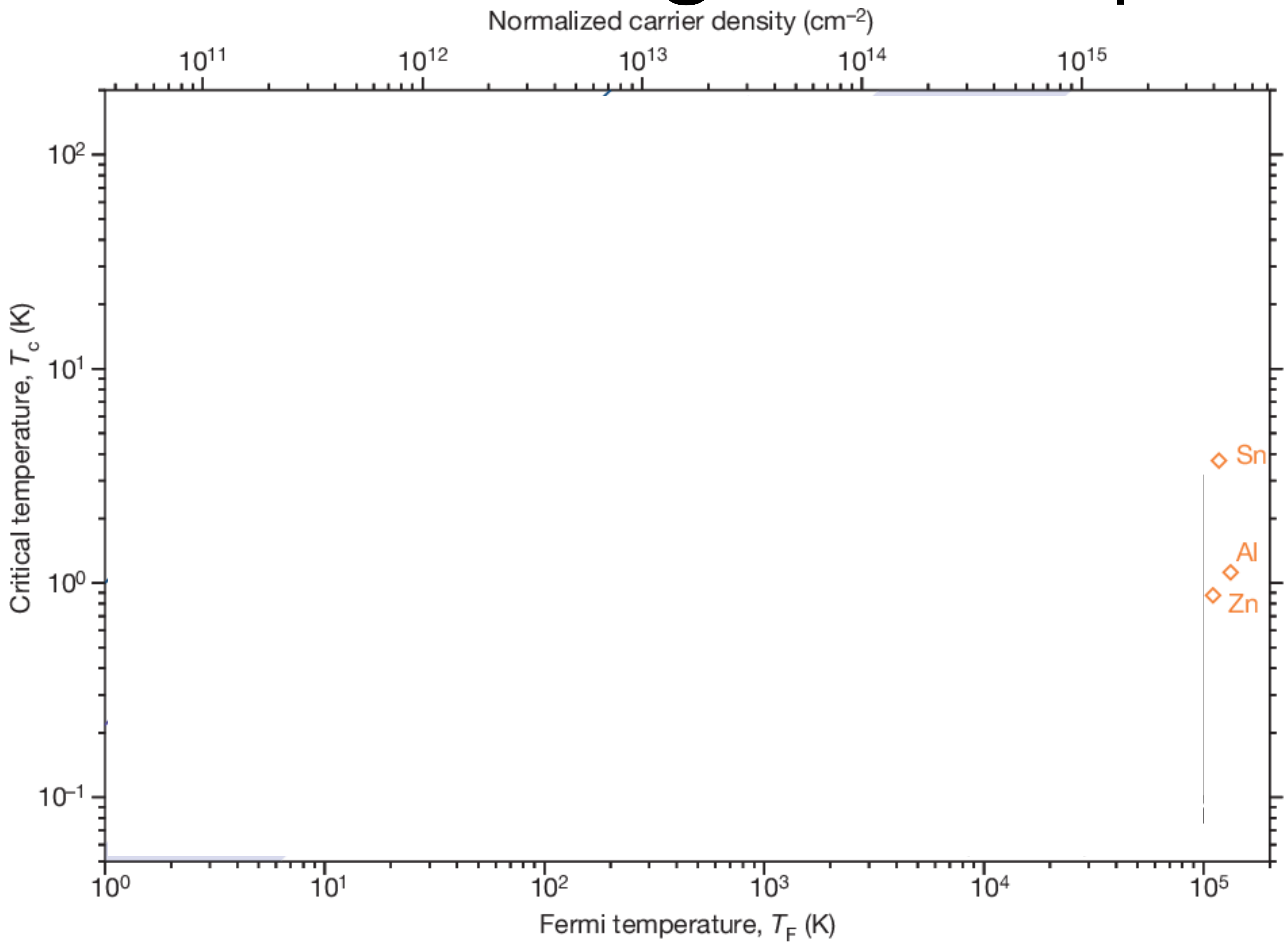

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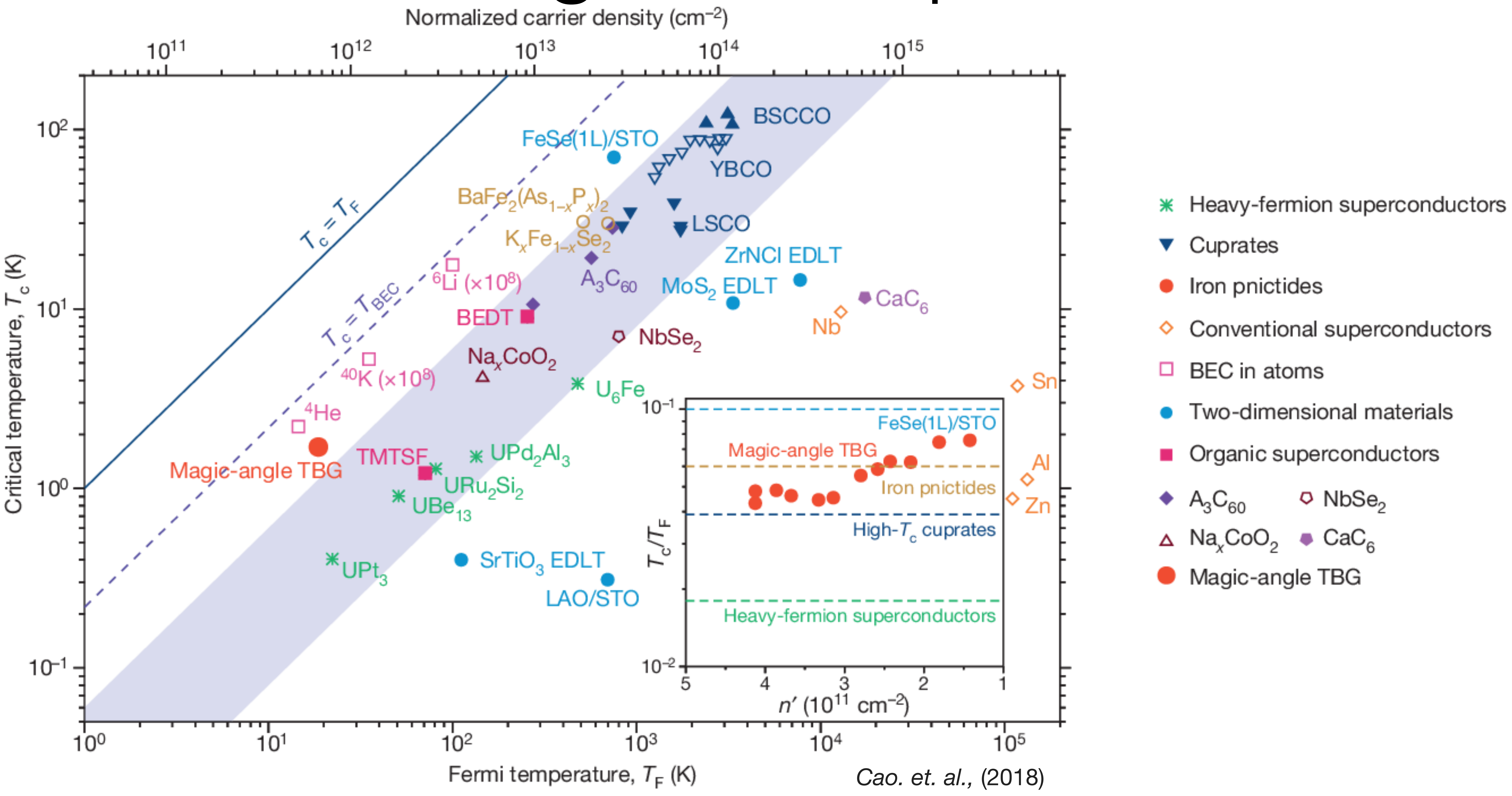

Cao. et. al., (2018)

Strange Materials: Mott insulator

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- Simplest **Mott insulator** is the Hubbard model

Hubbard model: A basic foundation for bilayer graphene

Hubbard (1963)

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- A model to describe interacting fermions where
  - They can only move between lattice sites
  - Interactions only happen at the lattice sites

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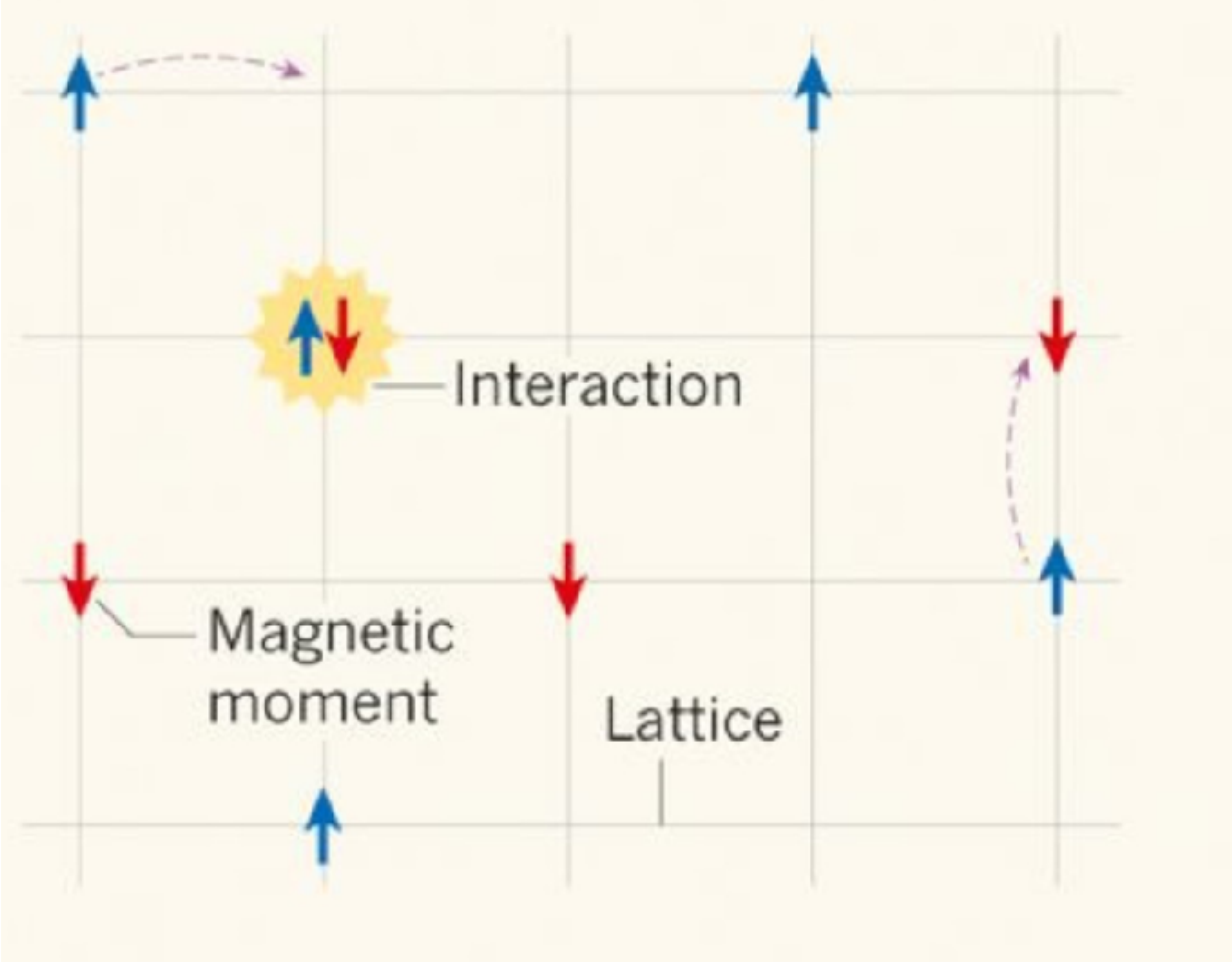

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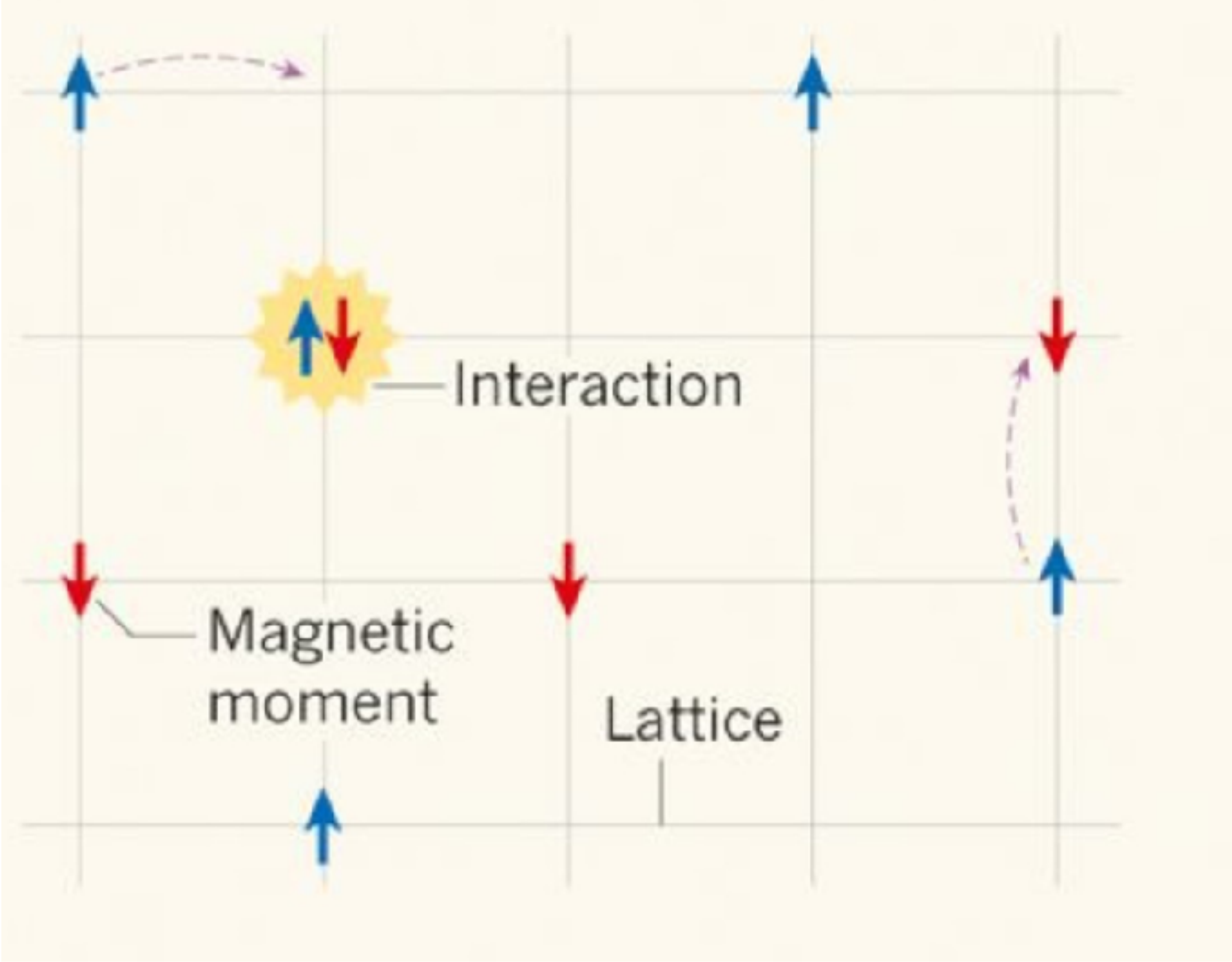

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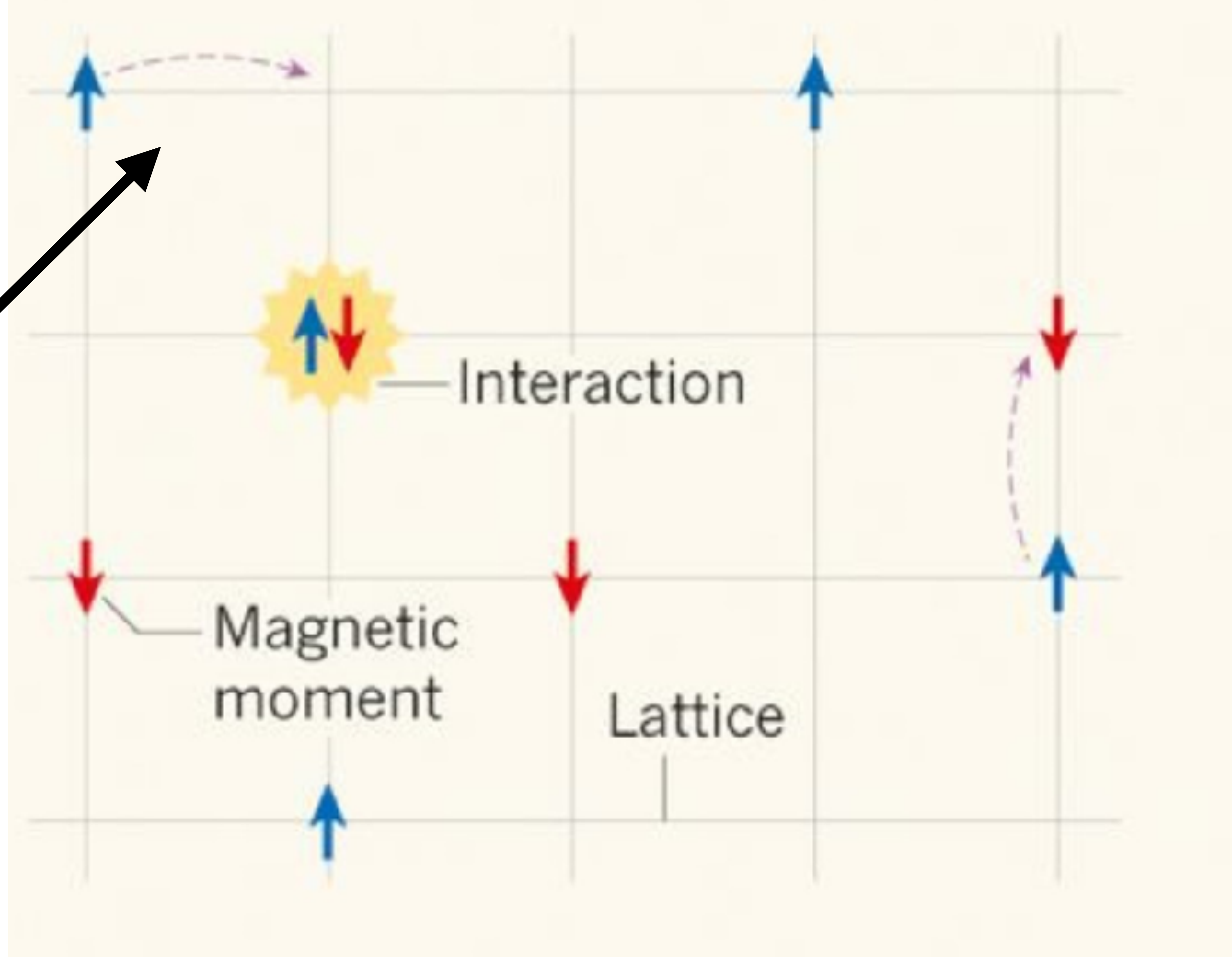

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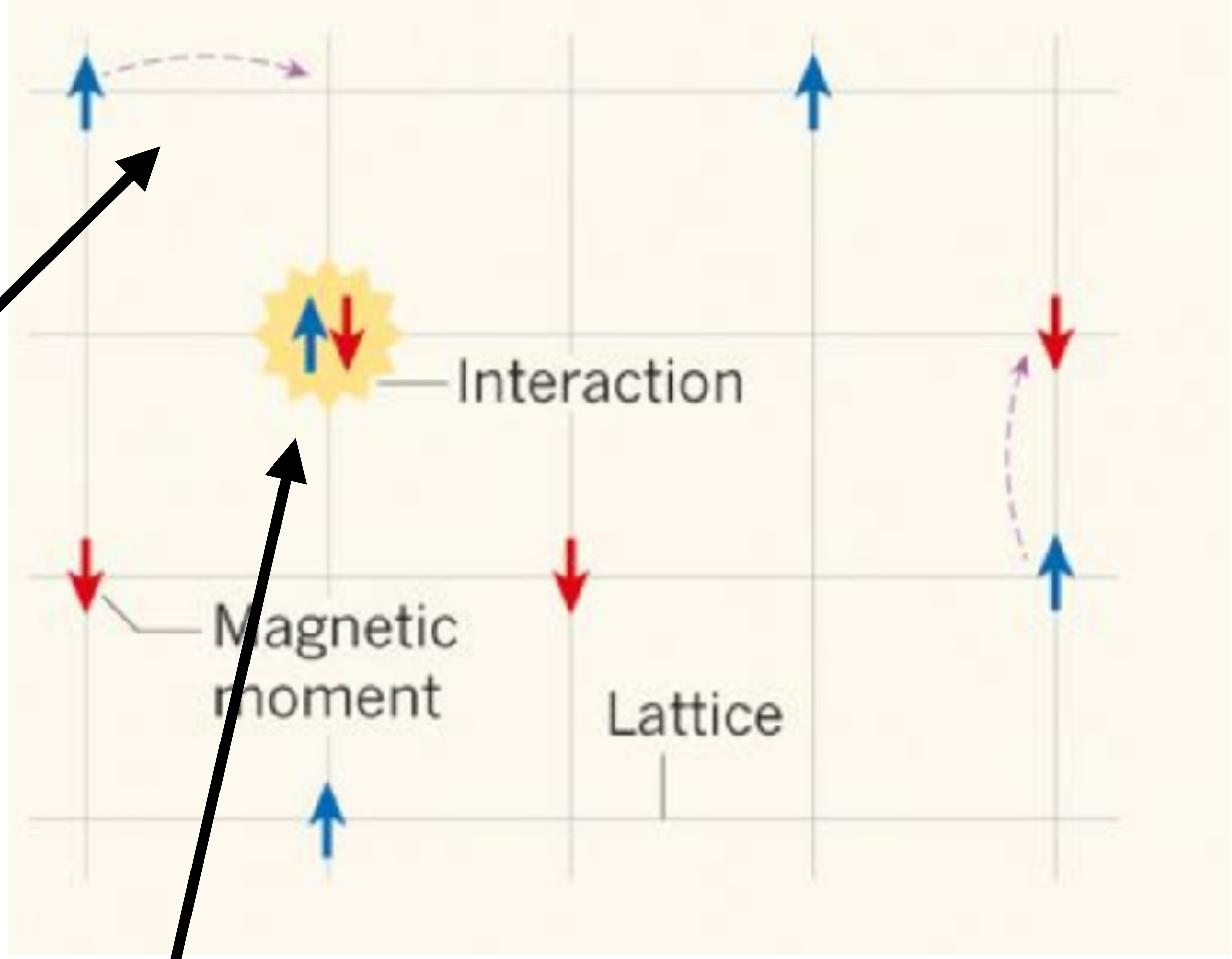

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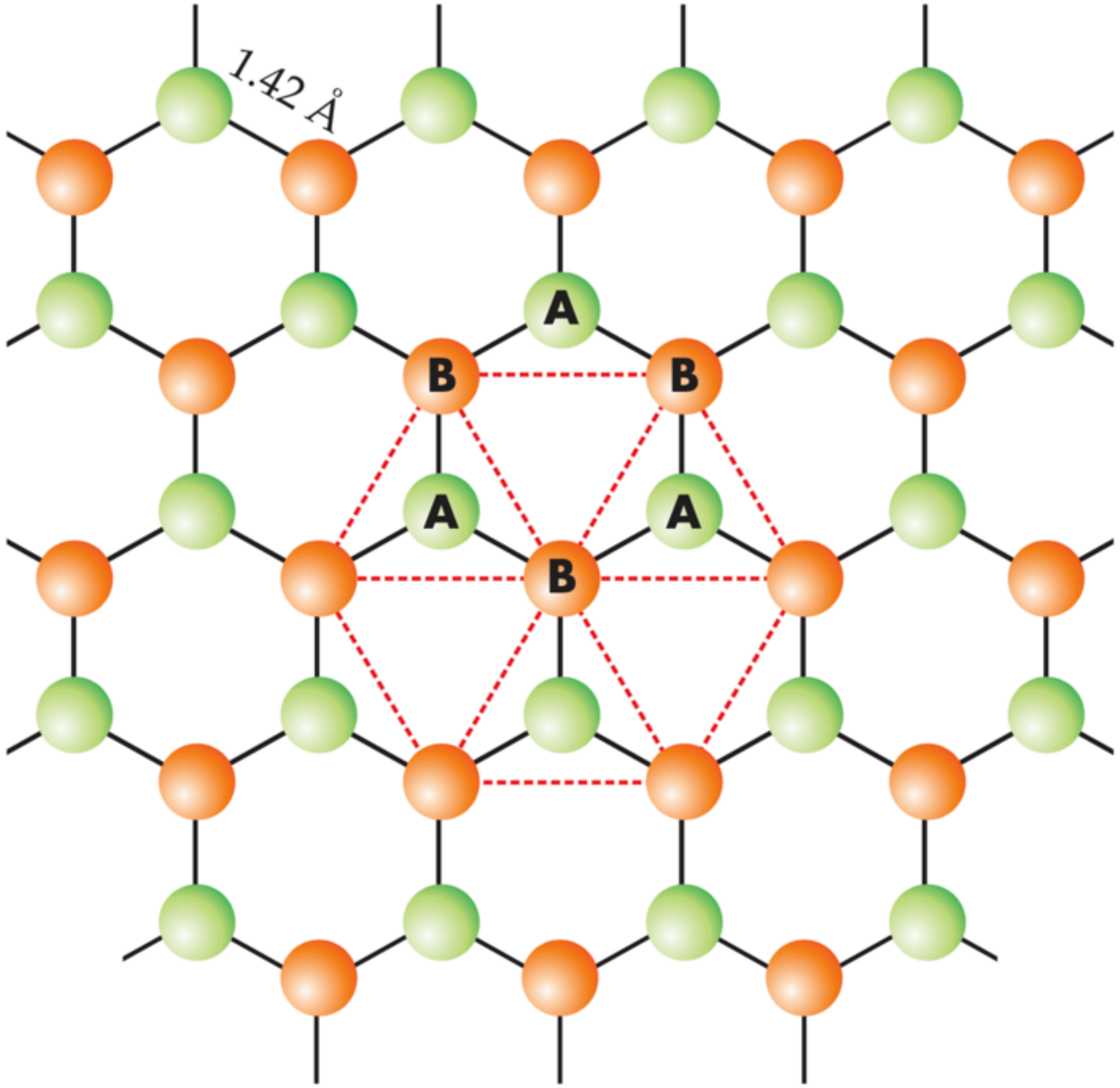

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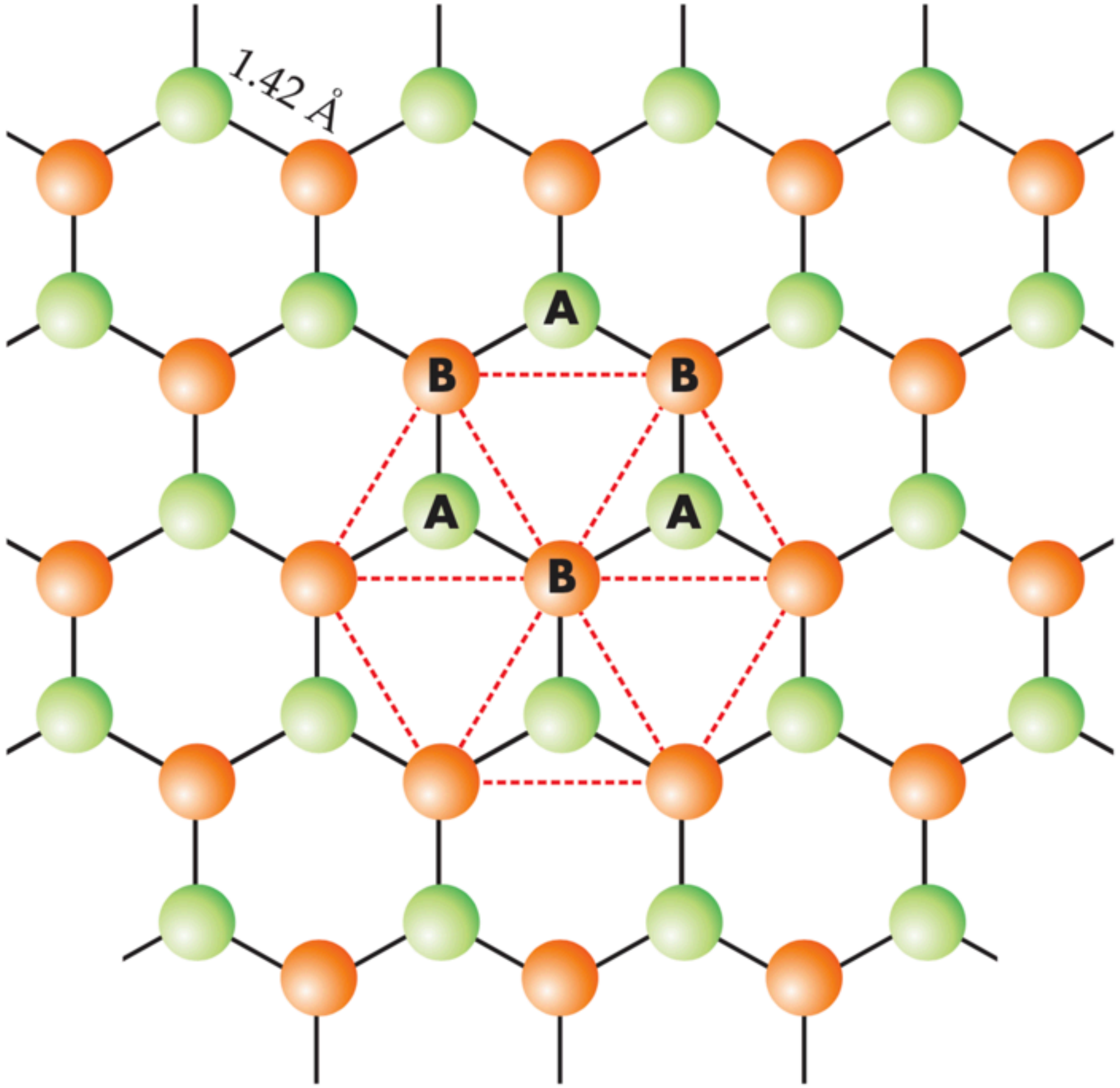

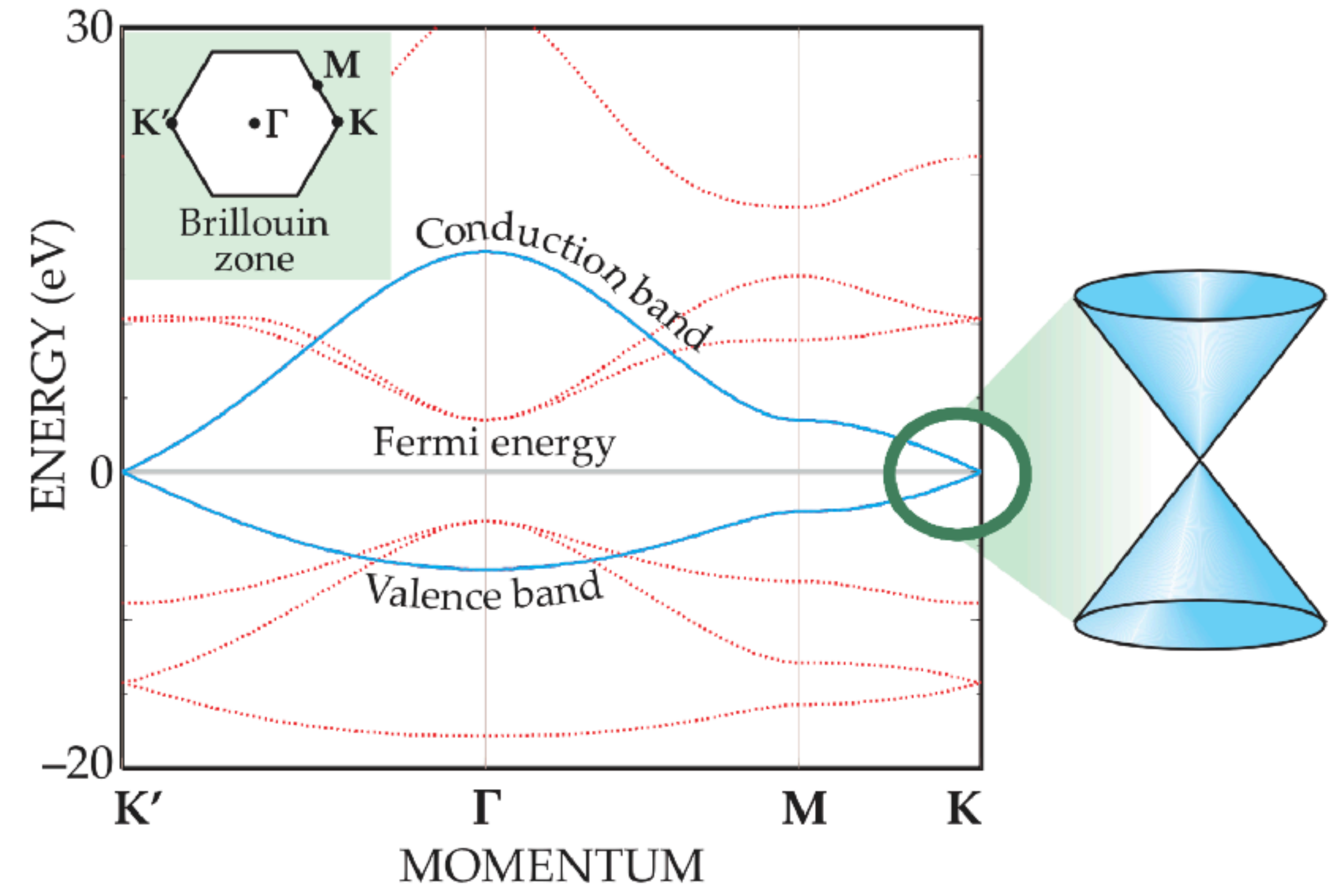

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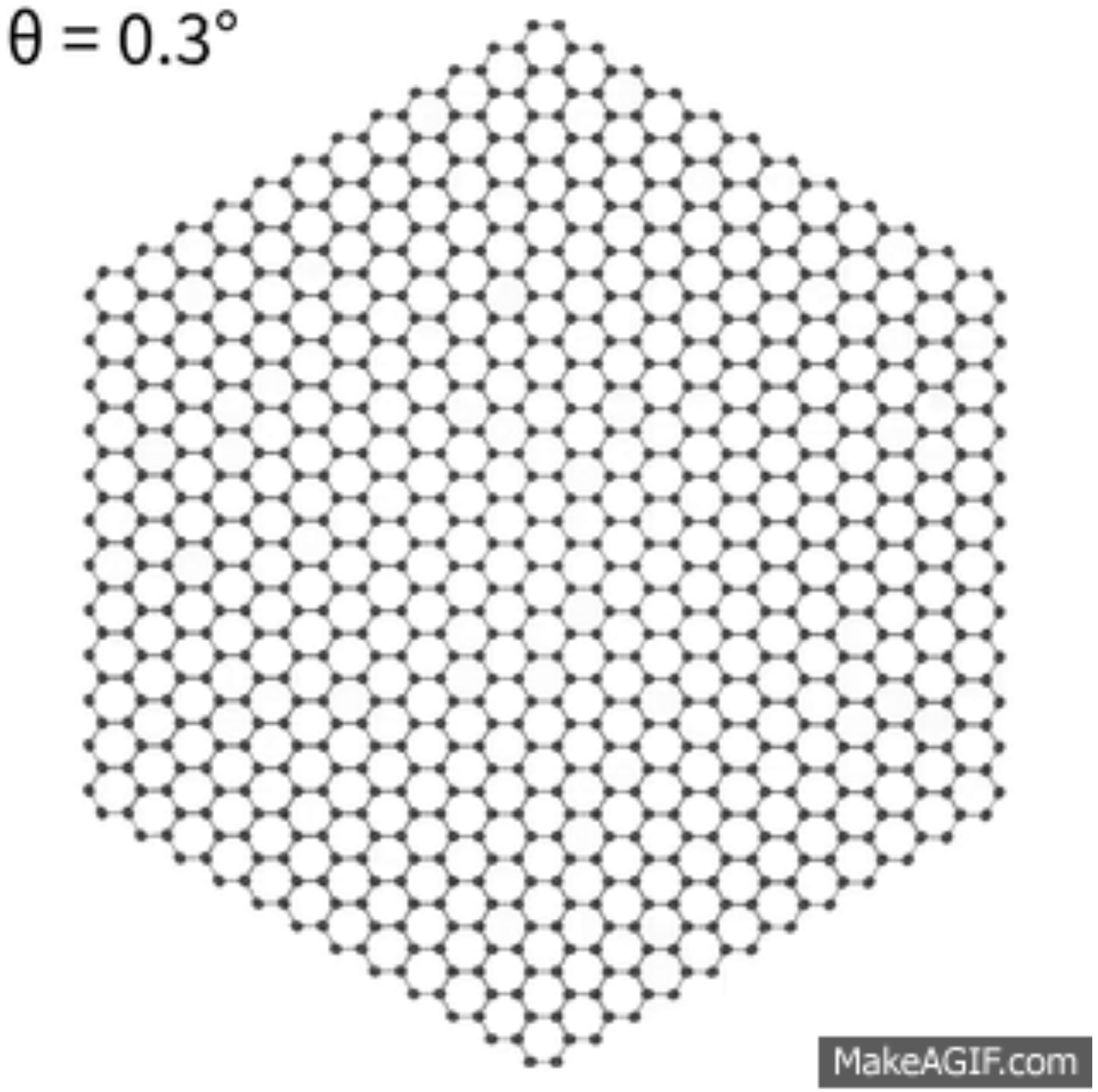
An interesting twist on graphene



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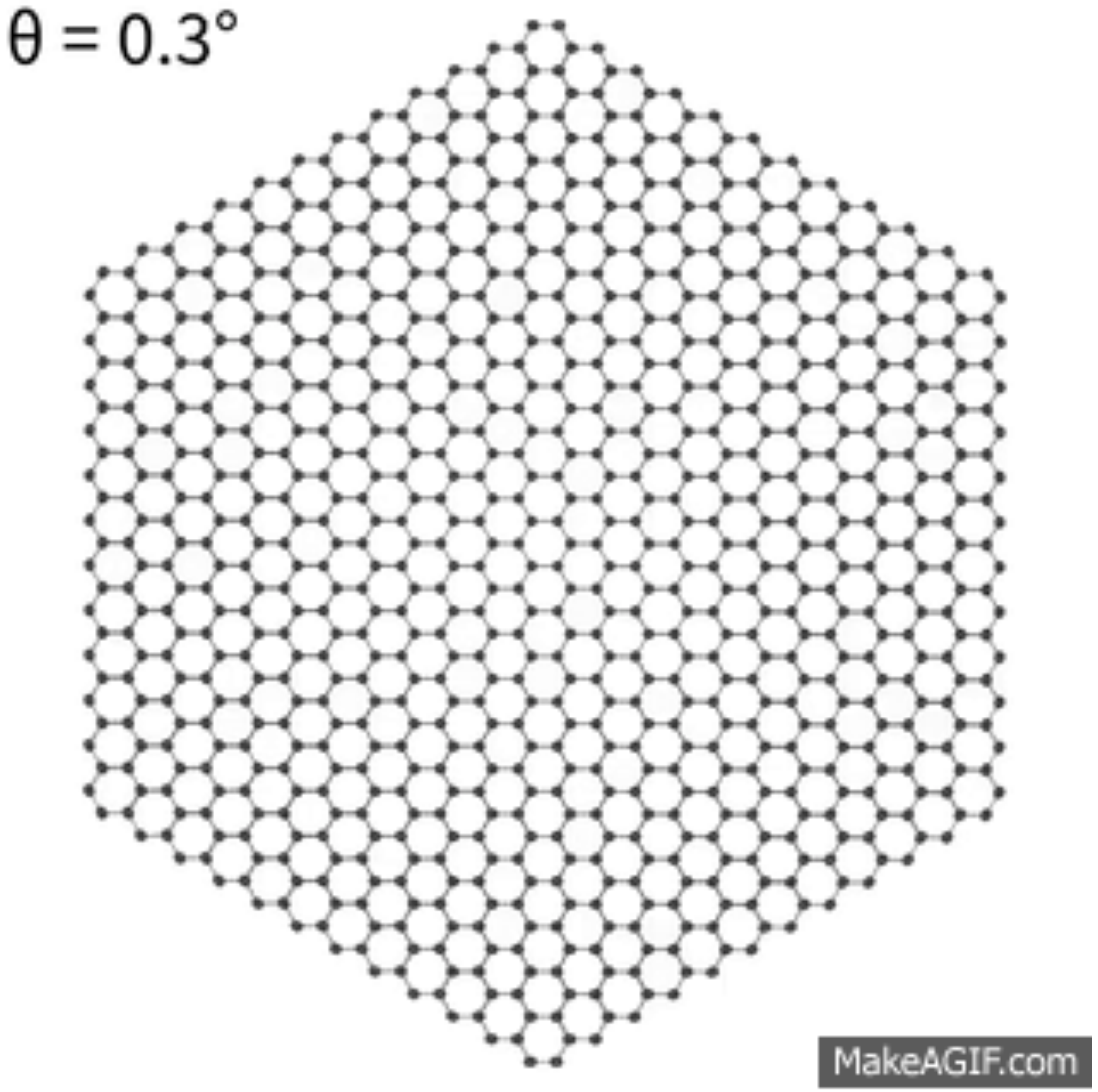

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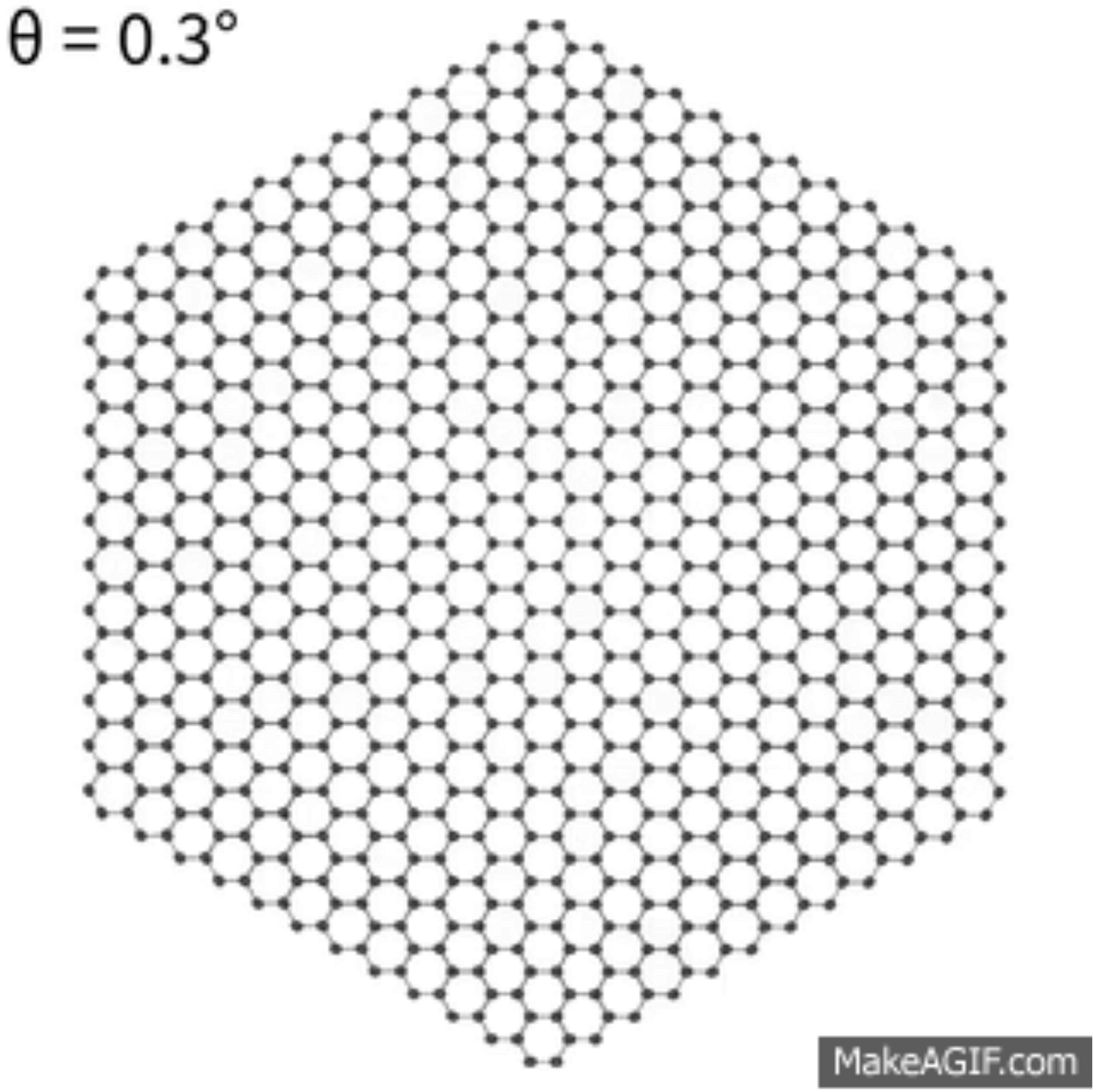
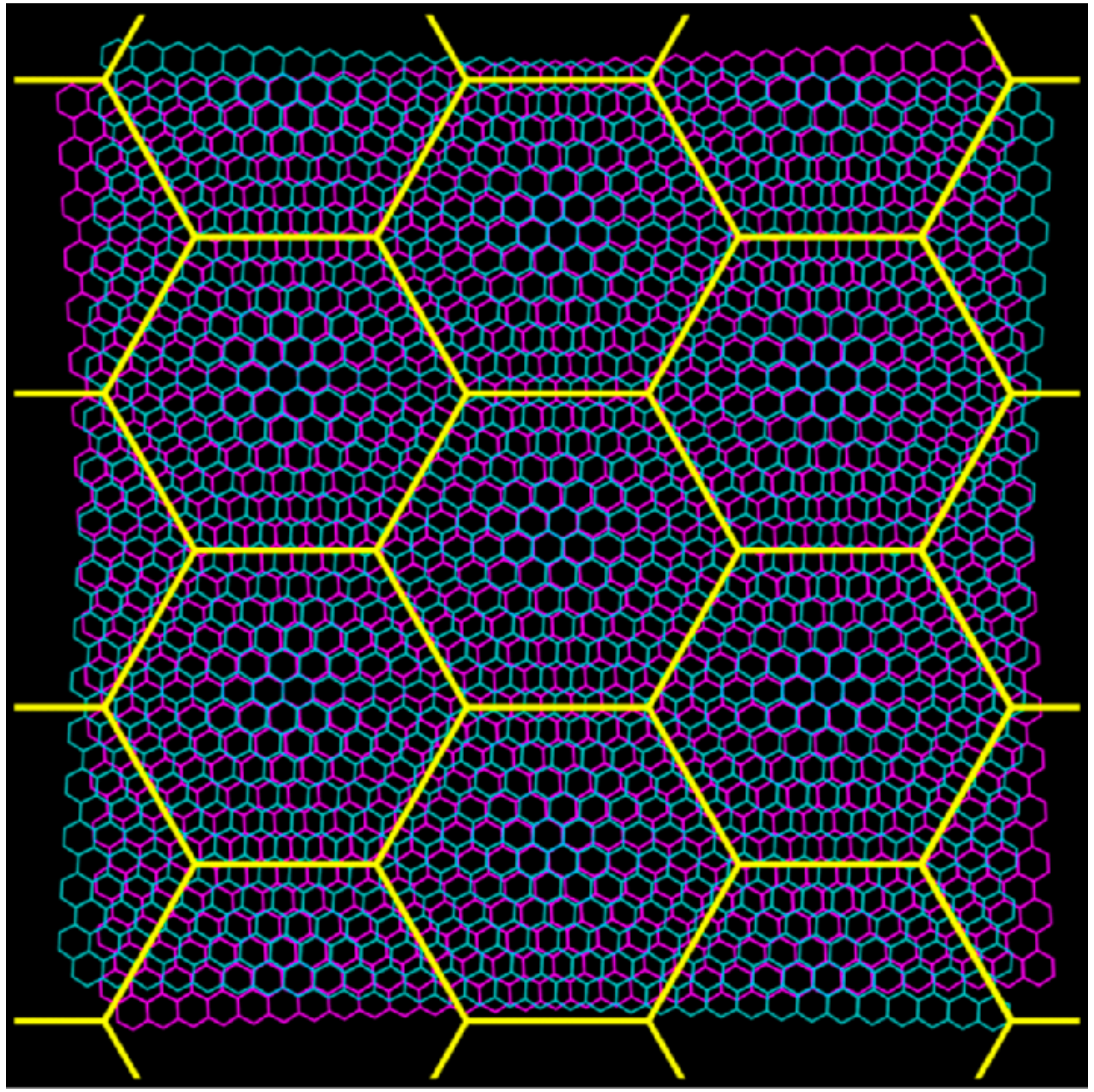
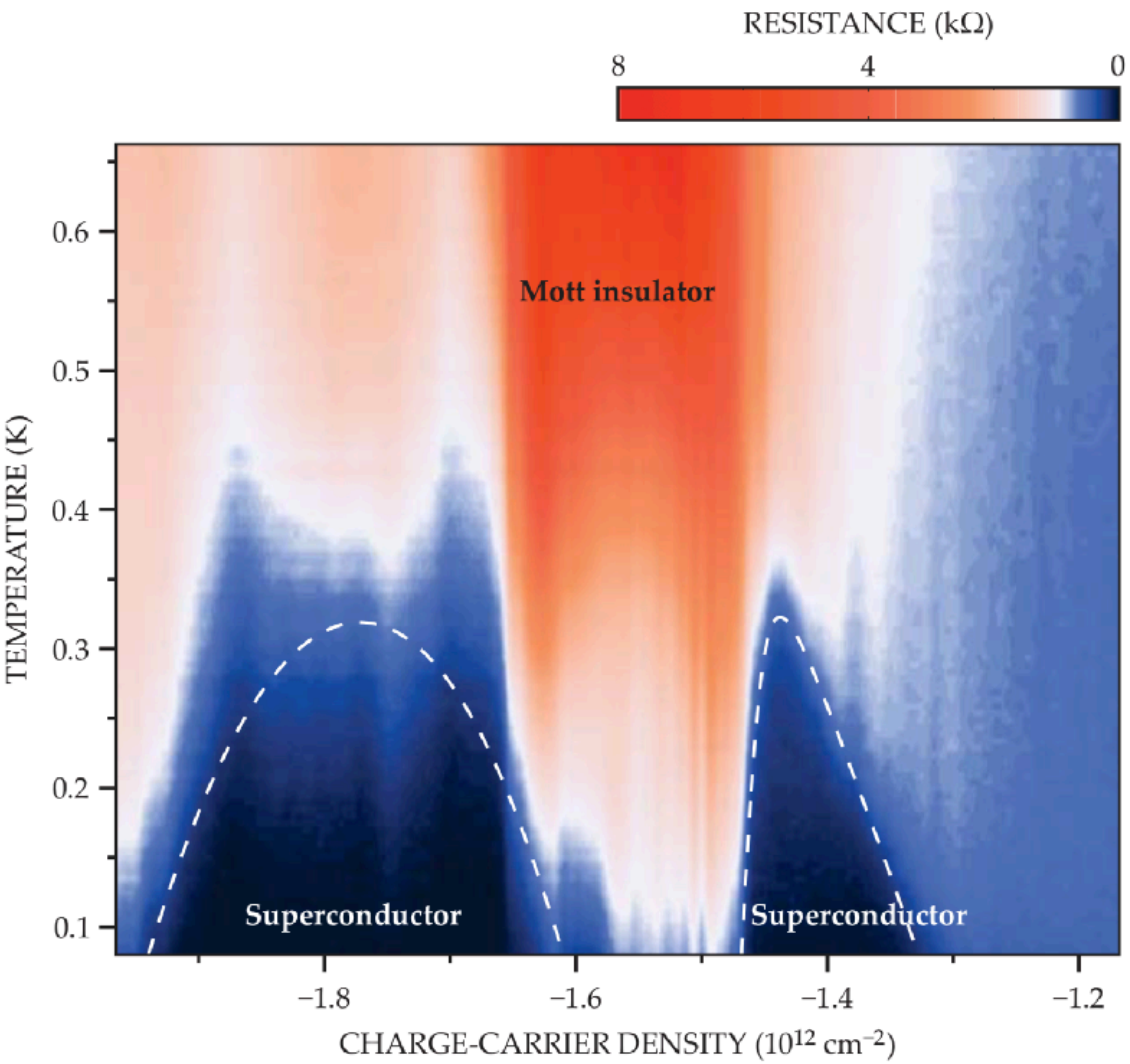




Physics Today (2018)

Magic angles give interesting phases



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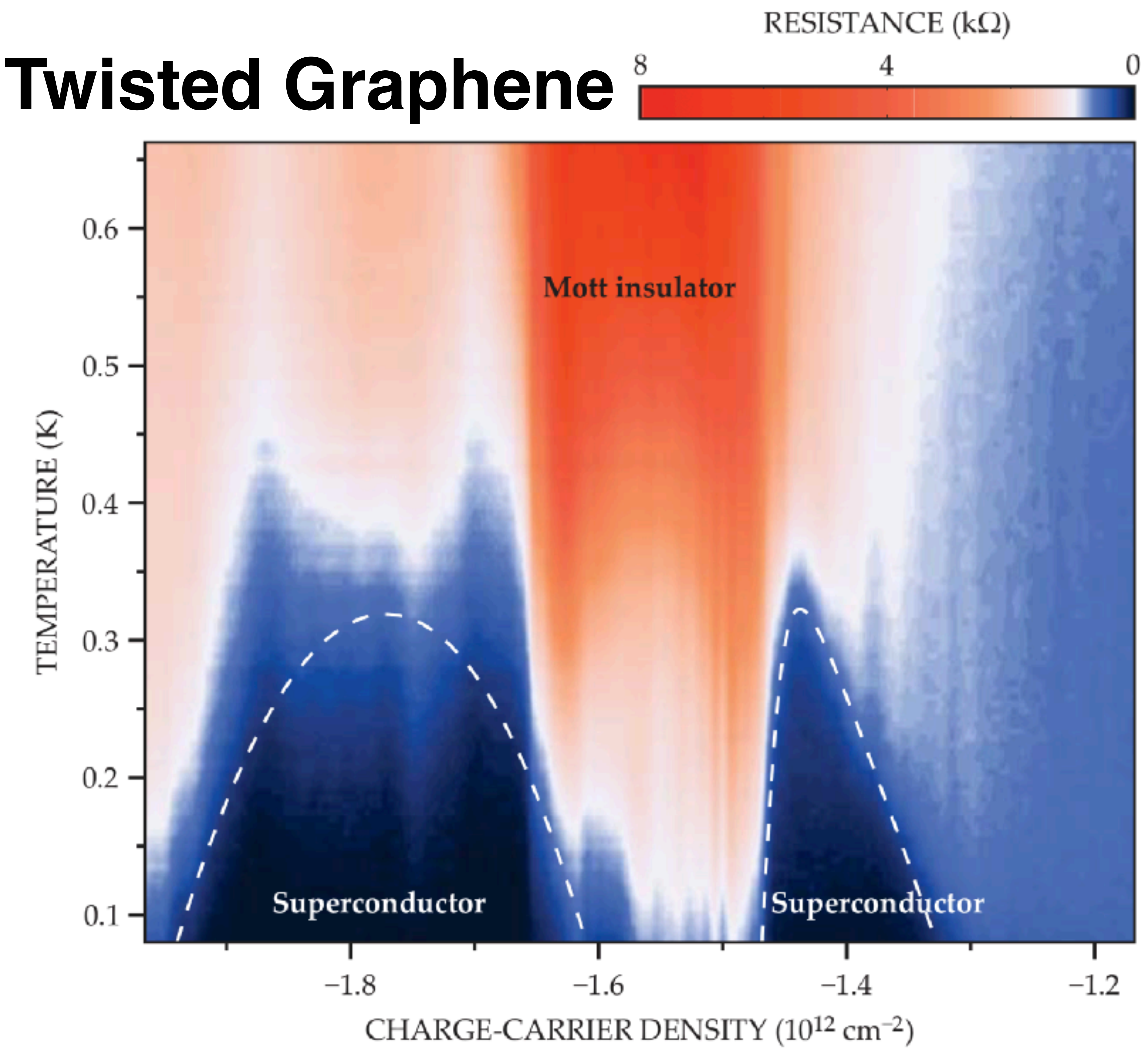

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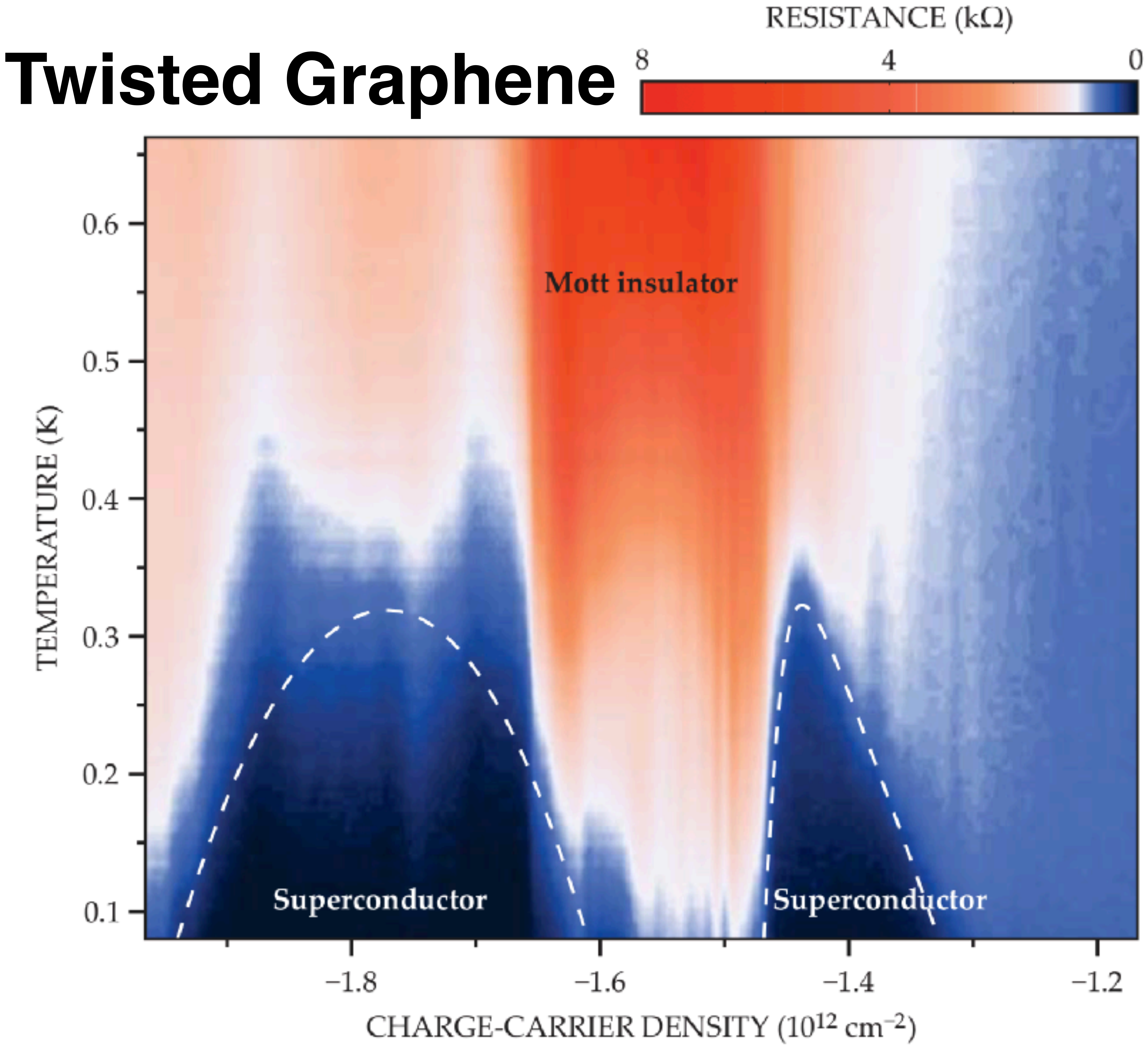

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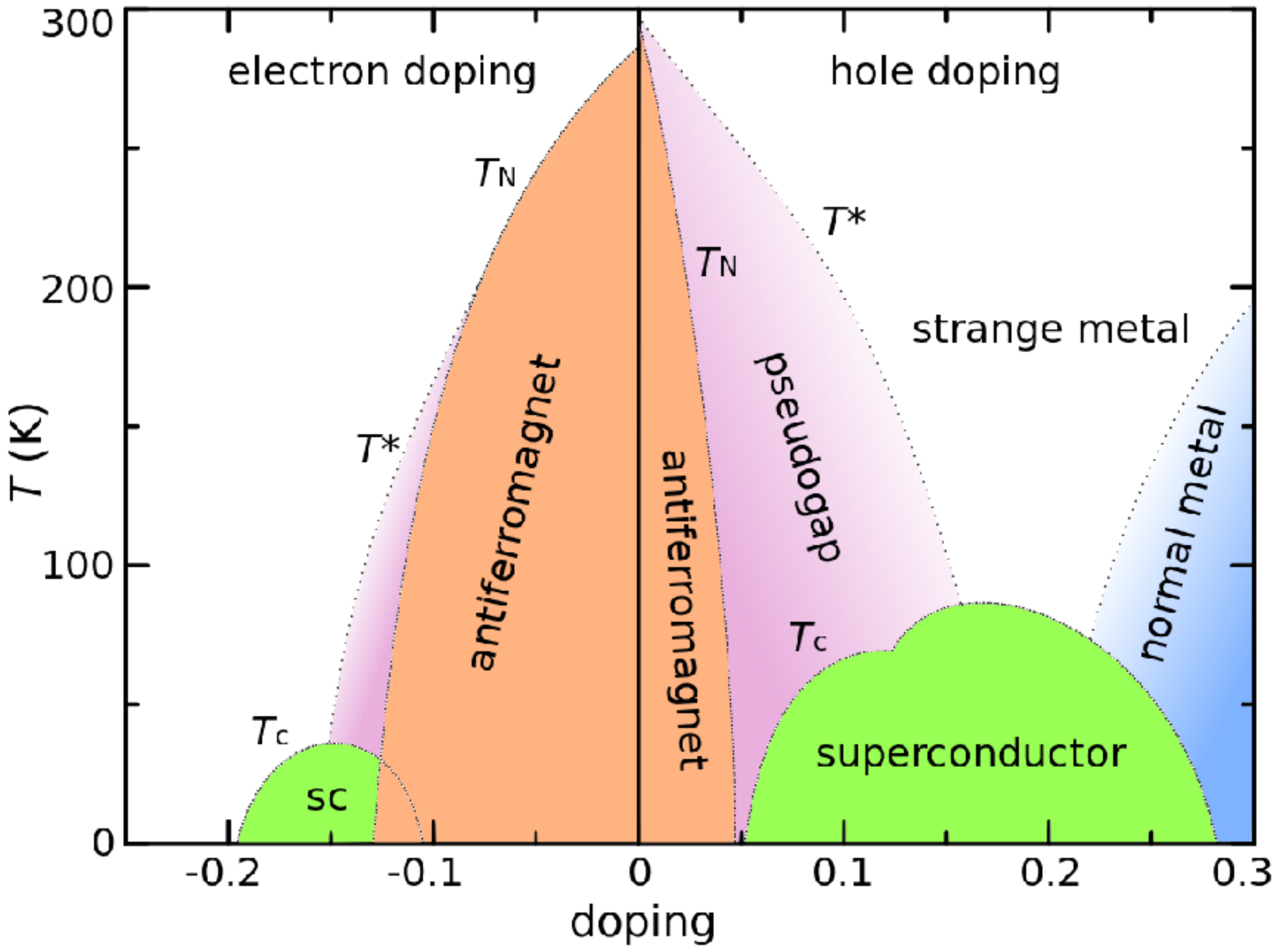
Cuprates



Credits: Holger Motzkau

Band Structure of Bilayer Graphene

Bistritzer & MacDonald (2011)

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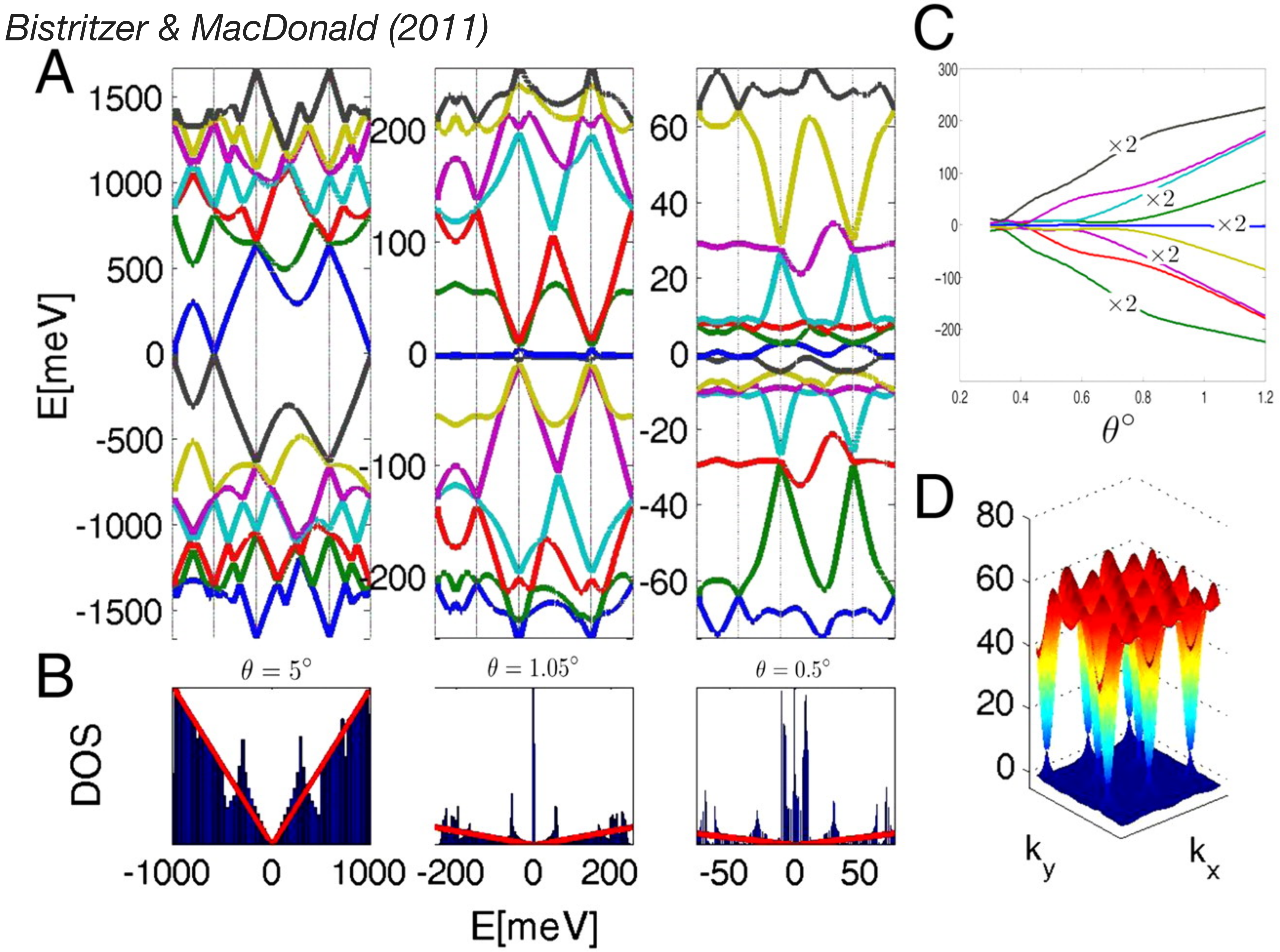

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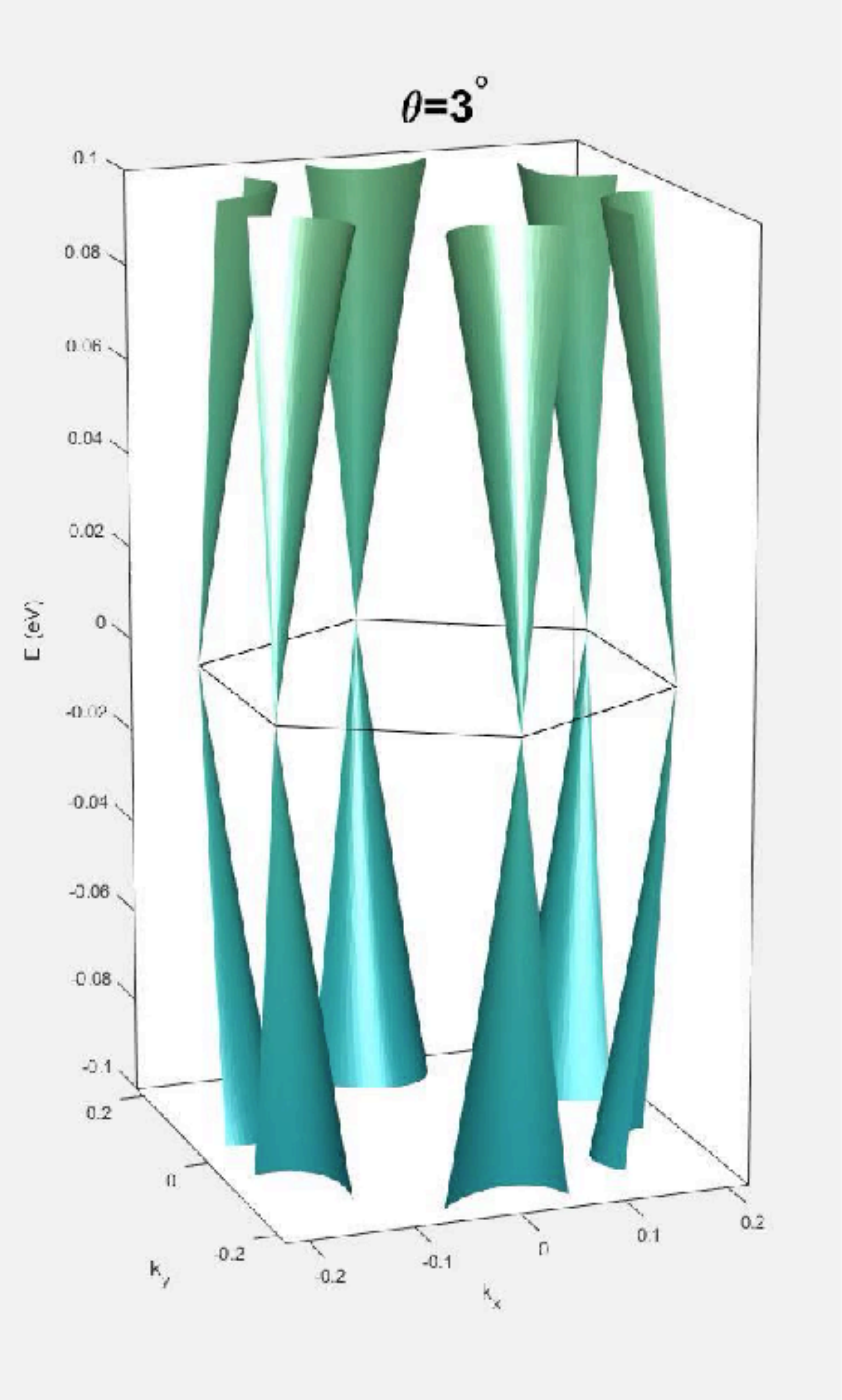

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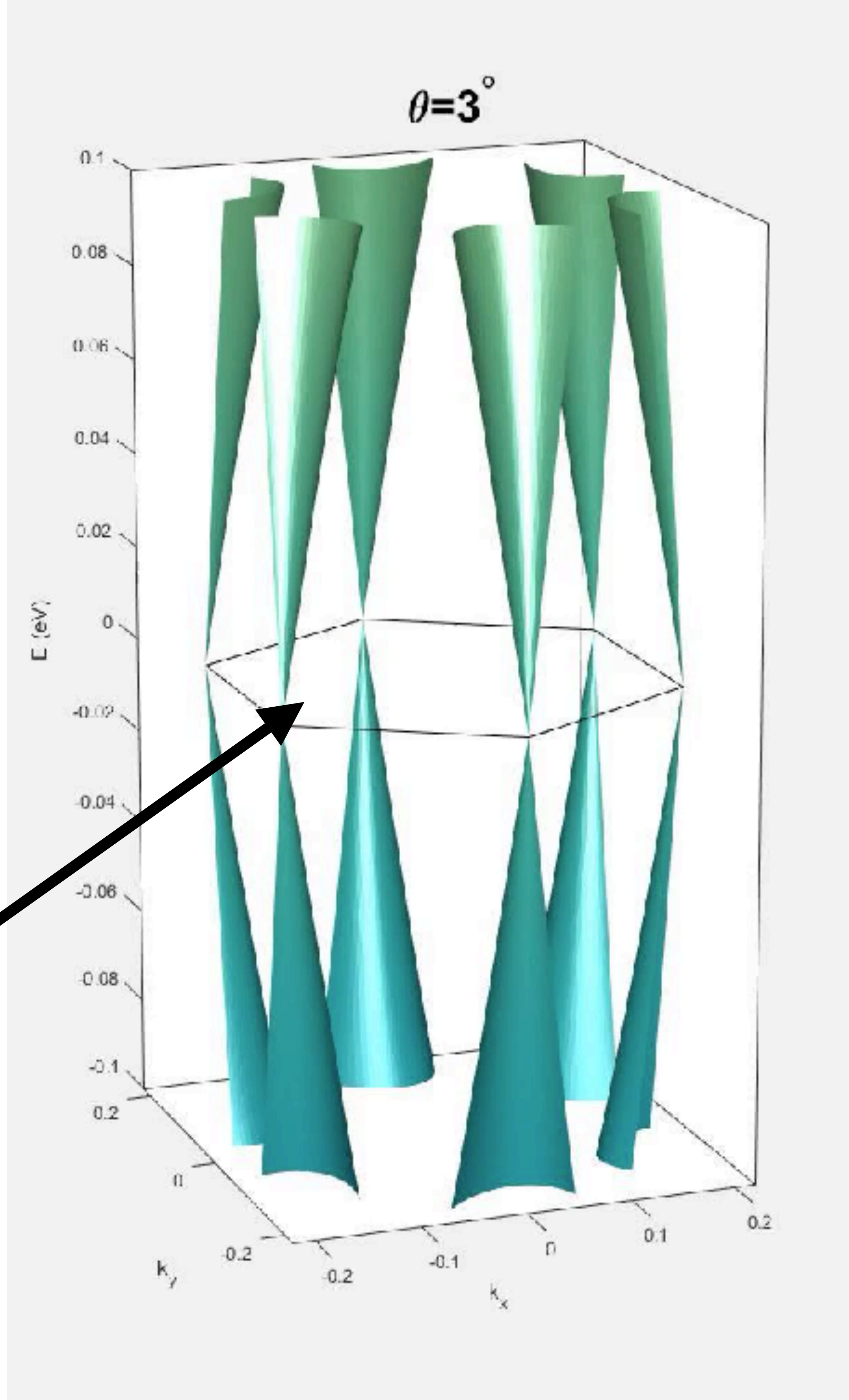
Strong Correlations



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- Model assumes electrons lie in flat bands that interact with one another through a **repulsive force**.
- The **material's ground state** is calculated for various electron densities in the limit of strong repulsive interactions.
- Model predicts a **Mott insulating state** showing unconventional **superconductivity**, agreeing experiments

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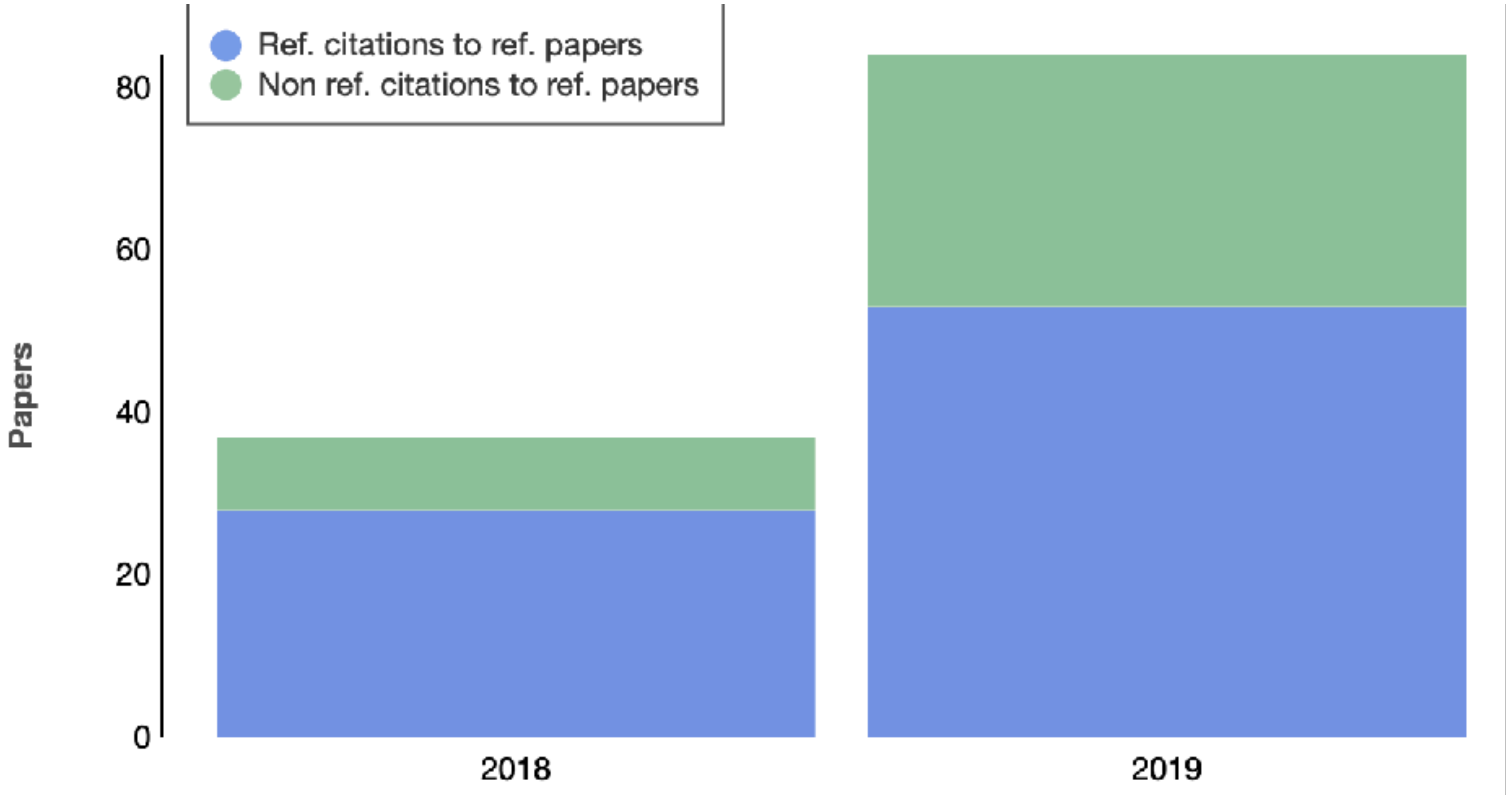
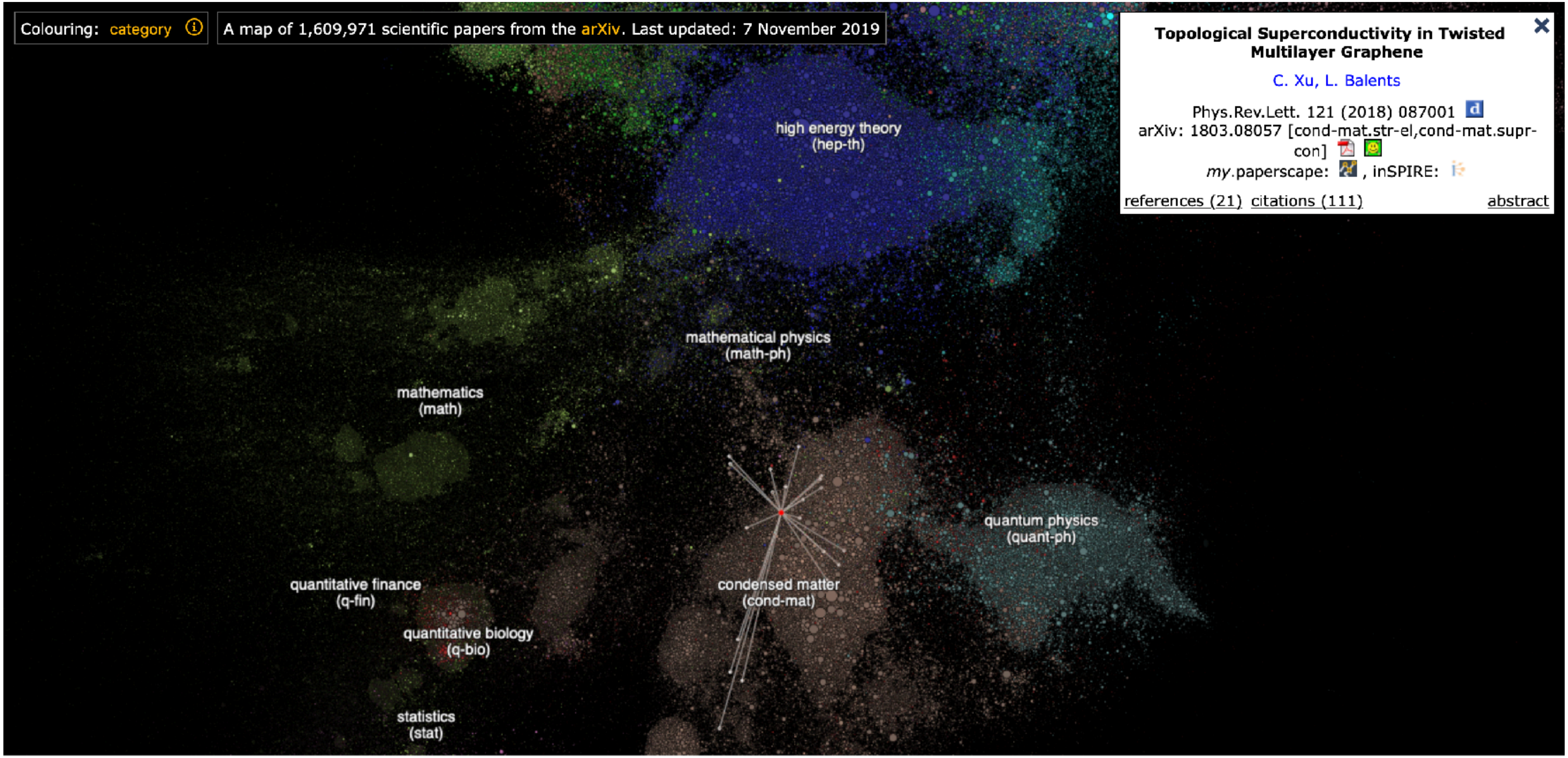
Citation Evaluation

- **143** citations according to Google Scholar
  - Most cited paper that cites this paper is "*Origin of Mott Insulating Behavior and Superconductivity in Twisted Bilayer Graphene*" with 167 citations.





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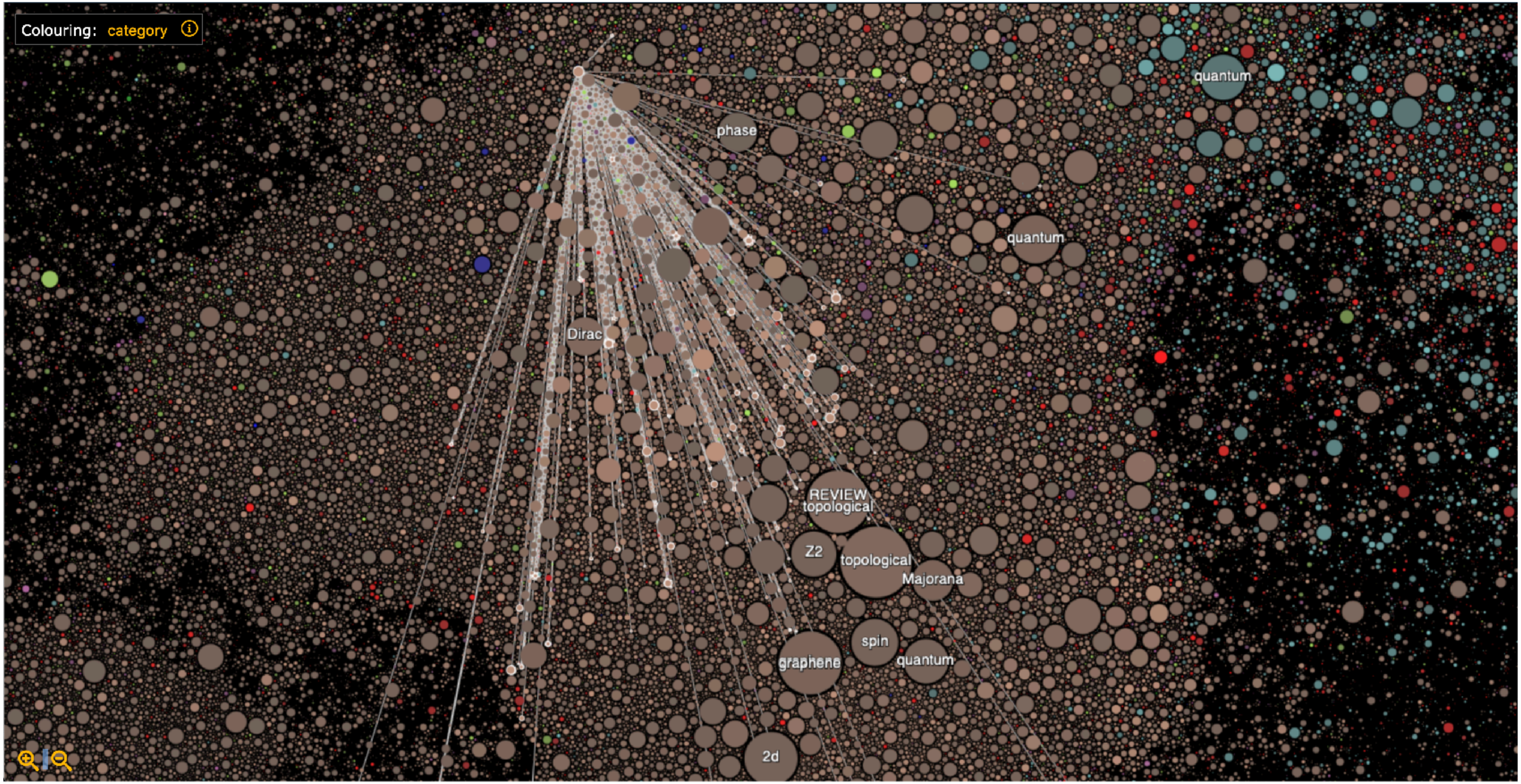

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