

Oddelení teoretické fyziky

Katedra fyziky kondenzovaných látek

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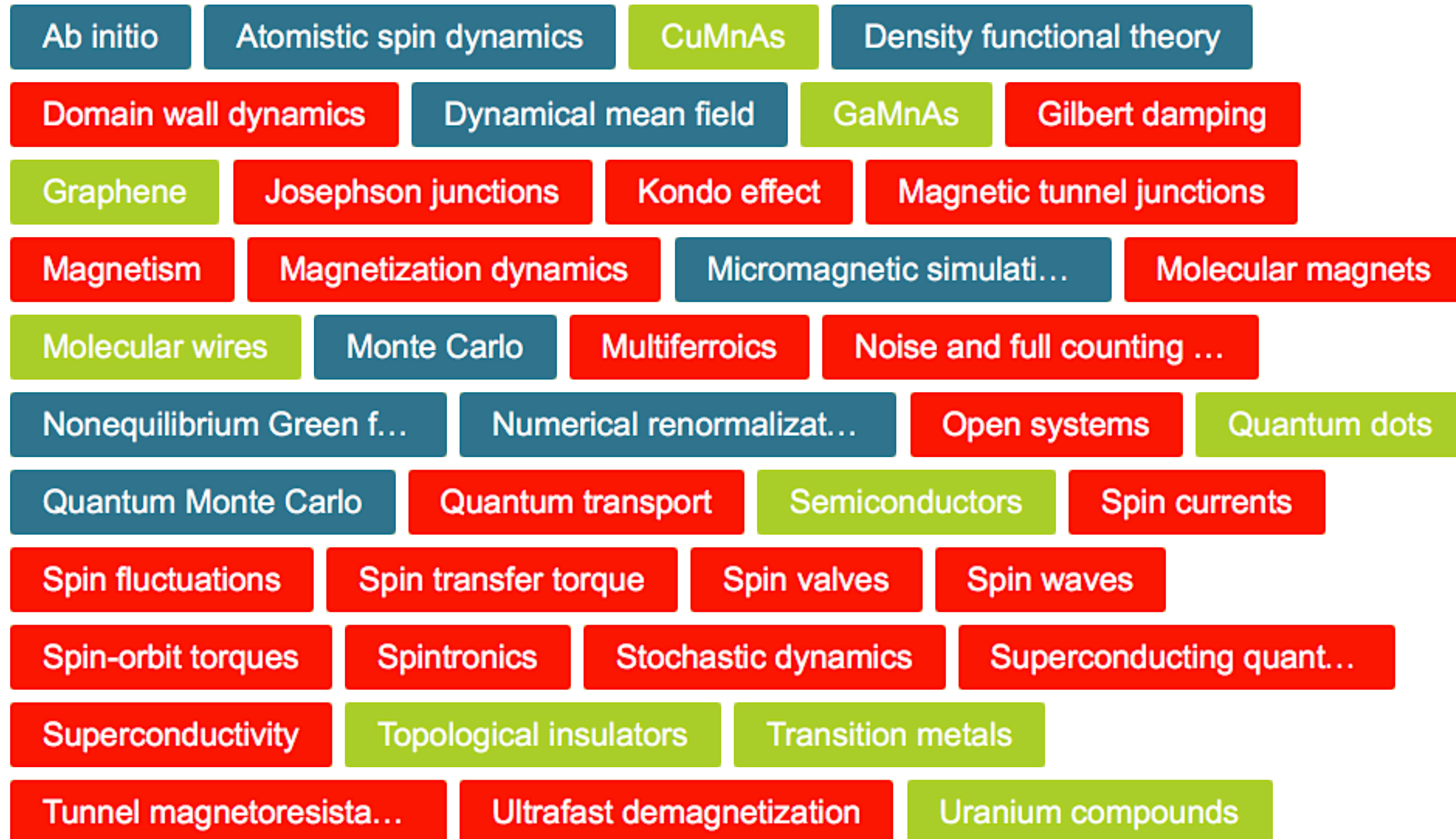
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theory.kfkl.cz

Topics, methods & systems



Systems

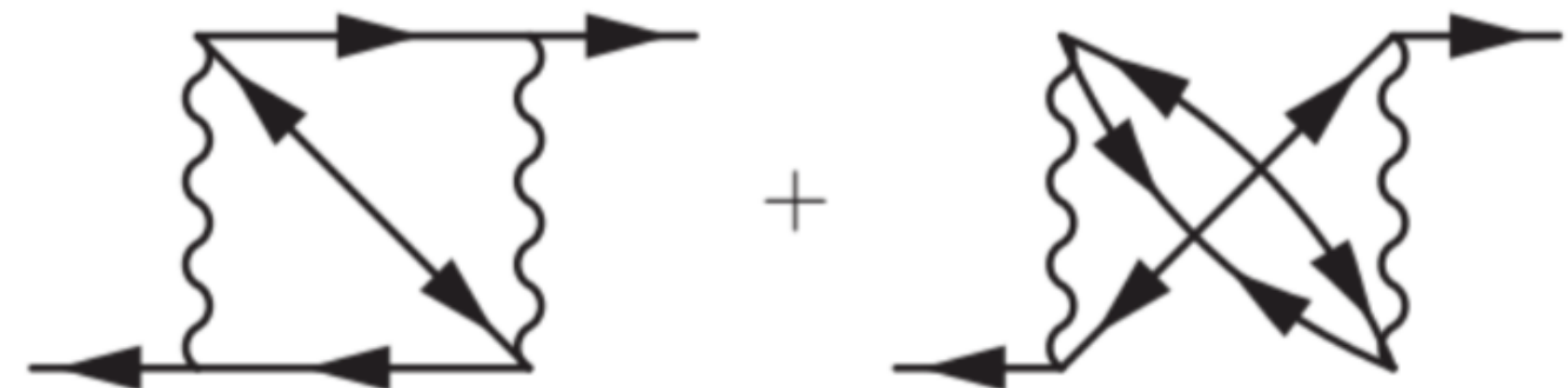
Systems with spontaneously broken symmetry

- superconductor (gauge symmetry)
- ferromagnet (rotational symmetry)

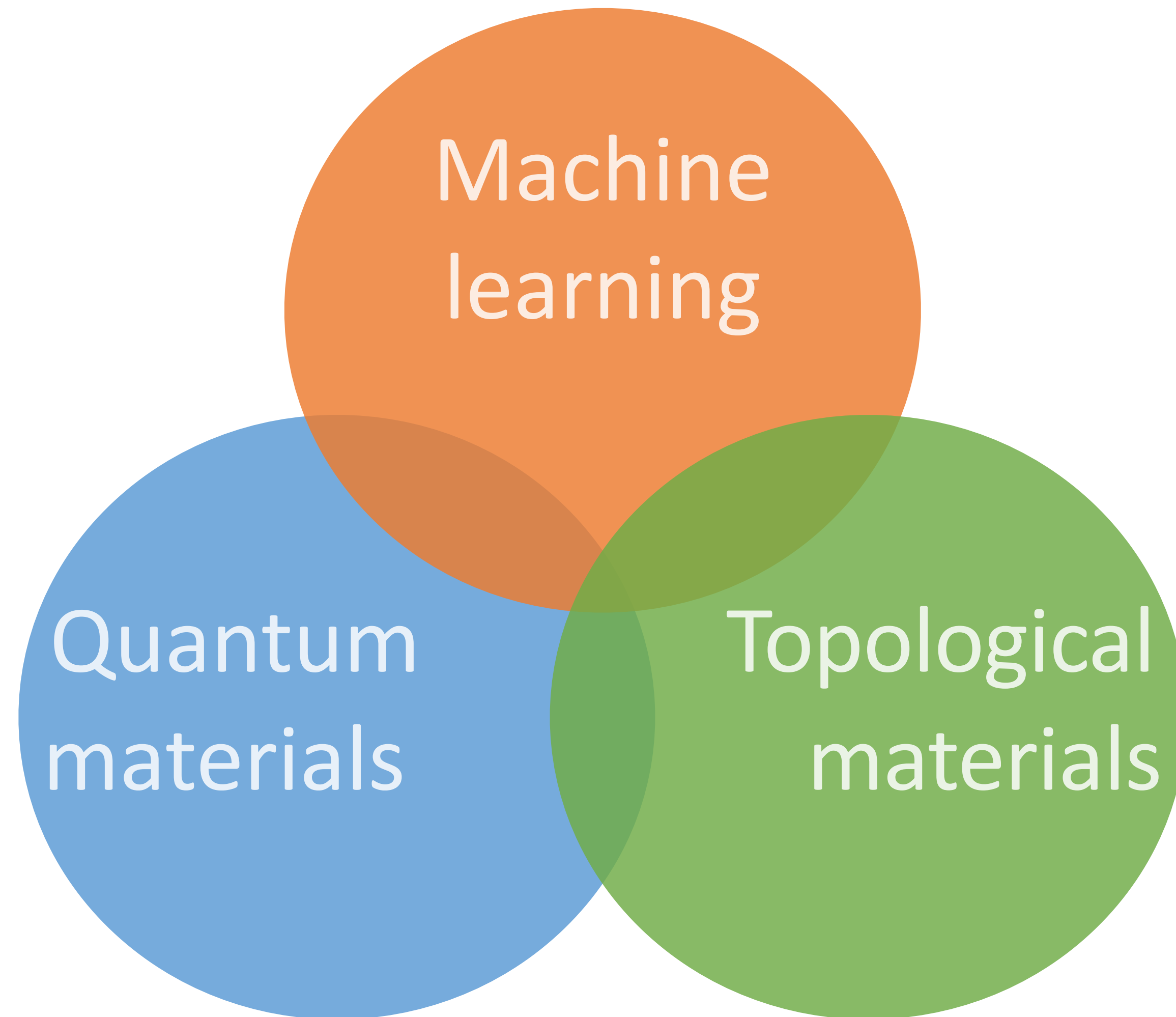
Methods

Vast range:

- classical physics
 - stochastic dynamics, molecular dynamics
- Statistical physics
- quantum many-body theory
- quantum field theory
- topology



Topics



Quantum Materials

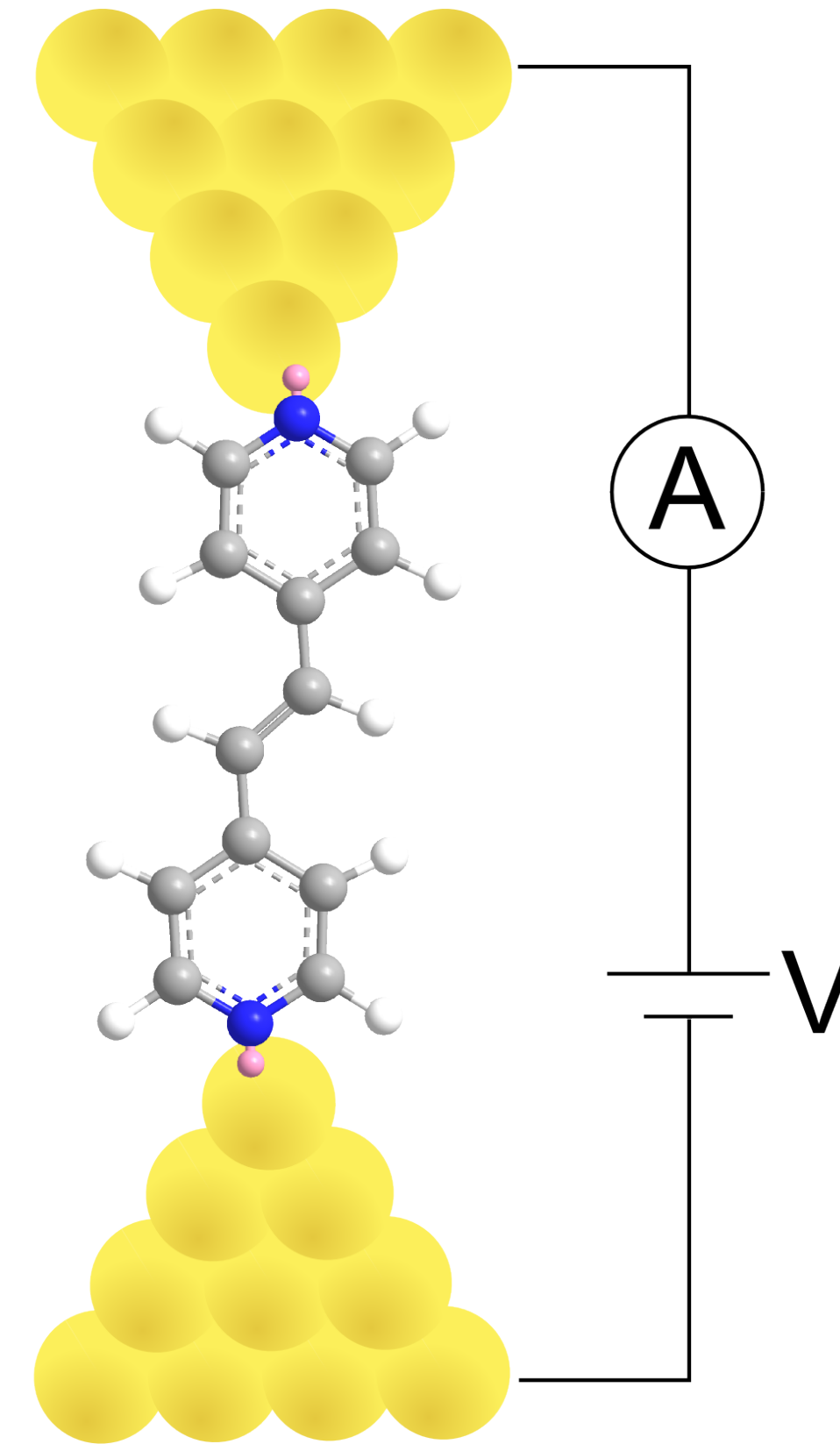
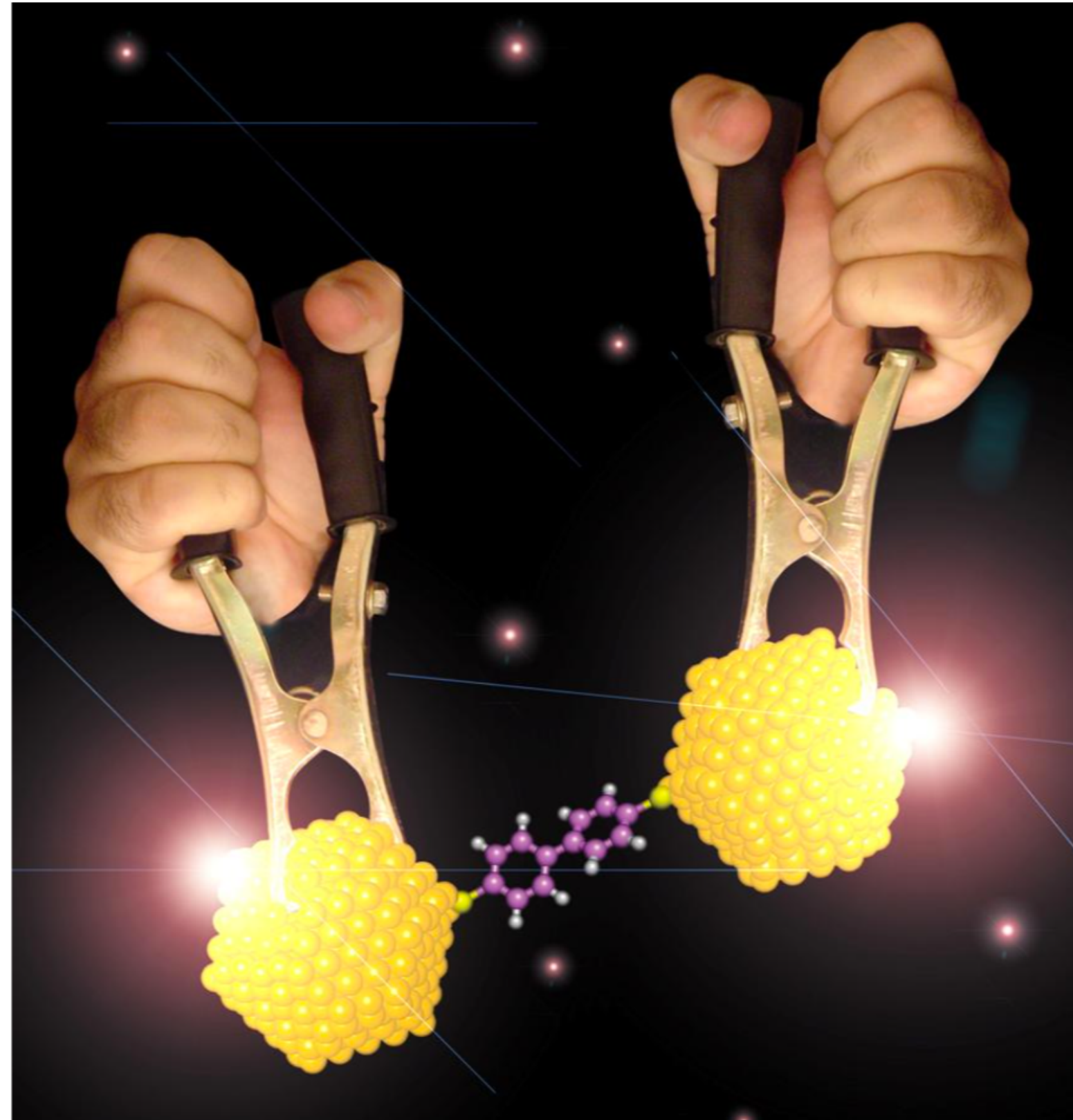
Cannot be understood by classical and elementary quantum mechanics

- Topological phases
 - (topological insulators, Weyl metals)
- Nontrivial electronic correlations
 - superconducting, magnetic
 - emergent low-energy behavior

“The physics of quantum materials”

B. Keimer & J. E. Moore, *Nature Physics*, **13**, 1045 (2017)

Quantum Materials: Molecular Electronics



F. Evers, R. Korytár, S. Tewari, J. M. van Ruitenbeek

Advances and challenges in single-molecule electron transport, **Reviews of Modern Physics** (2020)

Quantum Materials: Molecular Electronics

Opportunities for a theoretical physicist:

- transport of electric charge:
the conductance is fully determined by quantum effects
- transport of energy (heat)
- conversion of electric current into angular momentum
 - spin (a molecular bit)
 - mechanical rotation (molecular machine)

F. Evers, R. Korytár, S. Tewari, J. M. van Ruitenbeek

Advances and challenges in single-molecule electron transport, **Reviews of Modern Physics** (2020)

Quantum Materials: Molecular Electronics

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