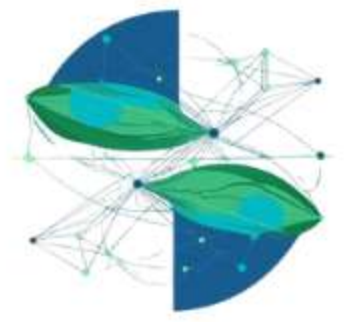




Science Fund
of the Republic of Serbia



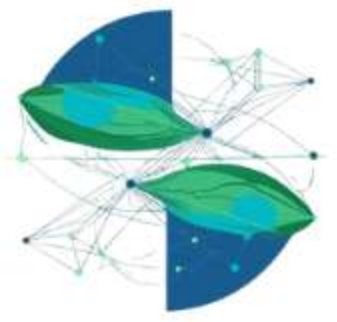
TopArtGravity

Minicourse announcement

Topology in Quantum Matter: from fundamentals to frontiers

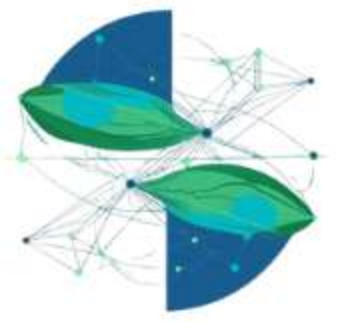


DIASPORA
Visits of Diaspora Scientists



1. Foundations: Berry phase & Chern number

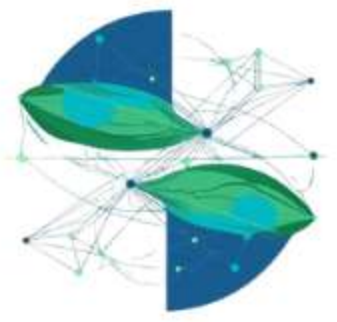
- Bloch bands and Bloch bundle
- Berry connection, curvature, and Zak phase
- Chern number/TKNN invariant. Hall conductivity.
- Bulk-boundary correspondence.
- Minimal models: Su-Schrieffer-Heeger, Bernevig-Hughes-Zhang, Haldane



2. Time-Reversal Topological Insulators & Superconductors.

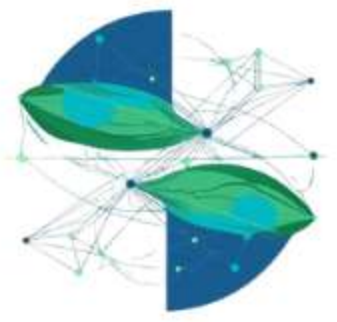
Tenfold way.

- Altland-Zirnbauer symmetry classes (TRS, PHS, chiral)
- Fu-Kane parity criterion and Pfaffian formulation
- 3D topological insulators.. 3D TI surface Dirac cone
- Kitaev chain and Majorana bound states



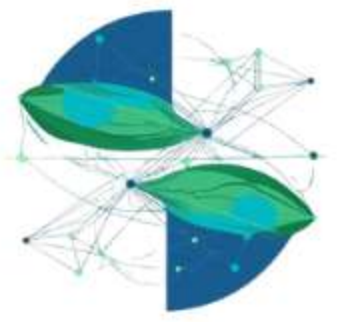
3. Crystalline Topology & Higher-Order Phases

- Symmetry indicators and topological quantum chemistry.
- Wannier obstruction and symmetry-protected topology.
- Mirror/rotation/inversion invariants.
- Higher-order TIs: hinge/corner states; fragile topology.



4. Quantum Geometry & Responses

- Quantum geometric tensor: Berry curvature + Fubini-Study metric
- Modern theory of polarization and orbital magnetization
- Anomalous Hall effect. Berry-curvature dipole and nonlinear Hall conductivity.
- Superfluid weight and geometric contributions
- Flat/near-flat Chern bands; moiré miniband geometry (overview)



5. Non-Hermitian Topology: NH Dirac fermions, Interactions, and flat bands.

- Biorthogonal formalism. NH Bloch bands.
- NH Dirac fermions.
- Interaction effects.
- Exceptional flat bands