

Colloquium Notice

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Quantum geometry goes nonlinear

Band theory, one of the enduring successes of the quantum revolution of the past century, has given us a purview into the physics of electrons in solids and has been extensively probed through linear response, and particularly, charge current response.

Here, I will show that nonlinear responses such as optical rectification and second harmonic generation offer a unique window into quantum observables that encode the basic elements of “quantum geometry”, a feature of multiband solids with broken symmetries. Such signals are only measurable going beyond linear response.

I will demonstrate that familiar analogues from the world of differential geometry -- curvatures and metrics – naturally appear in the nonlinear response regime and give rise to currents forbidden in linear response. As direct applications, I will present the mechanism for rectified current generation in twisted Moire superlattices, the Hall current in topological antiferromagnets, the role of quantum geometry in sliding ferroelectricity and time-reversal odd rectification in crystals.

I will conclude with an overview of the many prospective uses of the quantum geometric viewpoint on light-matter interaction, touching on how nonlinear signals can diagnose the order parameter of a topological superconductor, in a manner accessible only beyond the linear regime.

Monday

April 28, 2025

Starts at 12:15 PM

Coffee at 12:00 PM

Physics Conference Room, SB B326

This talk is accessible via [Zoom](#) or use

meeting ID 829 2687 2594 and **passcode 866995** to join