QUANTUM TOPICS SEMINAR

THE WEDDING OF MAXWELL AND SCHRODINGER

DANA ANDERSON

CHIEF TECHNOLOGY OFFICER, INFLEQTION
PROFESSOR OF PHYSICS UNIVERSITY OF COLORADO BOULDER,
FELLOW, JILA

This presentation introduces unexpected physics that arises as one considers circuit design involving ultracold atoms rather than electrons. As a technology, atom circuitry iscomplementary to both electronics and photonics in problem-solving applicability (think clocks, quantum computers, and sensors). It is simply not so well developed, hence the interest in understanding the physics and developing engineering design principles. The "new physics" enters with an inspiration from Maxwell's equations that asks about the properties of alternating (AC) matter currents. We know, of course, that alternating electric currents give rise to electromagnetic waves, and that generally the behavior of AC currents can be quite diHerent than the behavior of direct (DC) currents.

The formal treatment of AC matter currents surprisingly leads to a set of matter-wave duals to Maxwell's equations describing electromagnetic waves, though these duals have properties that are importantly diHerent from the electromagnetic versions in unintuitive ways. Surprising behavior also arises in the mechanics of AC matter waves, such as substantial tunneling through barriers that occurs even at low particle energy. I will provide a deeper look at the nature of and relationship between DC matter waves, which are the familiar solutions to Schrödinger's equation, and.their AC cousins that are described by Maxwell-like wave equations. I will also briefly discuss the class of atom circuitry that can be used to generate AC matter waves.

FEBRUARY 4TH, 2025 2:00-3:00 P.M. EST
BIRCK NANOTECHNOLOGY CENTER ROOM 1001

JOIN OVER ZOOM
HTTPS://PURDUE-EDU.ZOOM.US/J/93827339147

PURDUE UNIVERSITY | Purdue Quantum Science and Engineering Institute