

**Anasua Chatterjee, Colloquium October 31, 2025 – Host Dominik Zumbühl**

**Increasing the complexity of semiconductor quantum devices**

Nanofabrication and measurement advances have enabled experimental device physicists to design nanoscale quantum devices with unprecedented miniaturization and yield, ushering in a new age of complexity in the resulting quantum phenomena. As these quantum devices are scaled up in linear and two-dimensional arrays, the density of gate electrodes can also lead to more and more operational complexity. In this talk, I will present our advances in implementing fast, high-fidelity, and simultaneous readout of spin qubits, as well as in the automated tuning, loading and calibration of gate-voltage controlled arrays of quantum dots. Complexity can also be introduced through diverse materials and circuit engineering, and I will also describe added functionality arising from superconductor-semiconductor hybrids, leading to fruitful cross-connections between the fields of quantum information and more fundamental condensed matter physics.