Design and assembly of electronics for cryogenic quantum materials measurements

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Two-dimensional electronic systems form a bedrock of quantum condensed matter physics. Quantum Hall effects, Hofstadter's fractal spectrum, topological insulators, the Hubbard model, and the planar building blocks of cuprate superconductors are key examples. Two-dimensional materials, like graphene, have played a central role in advancing the field over the last decade, in part due to the ease with which different layers can be integrated together to engineer new systems with new electronic properties. My lab specializes in designing and assembling multiple two-dimensional materials into structures for electrical measurements at millikelvin temperatures and in large magnetic fields.

This project will involve designing and building electrical components for measuring two-dimensional materials at cryogenic temperatures. This work will involve computer design elements like CAD, circuit design, and programming (e.g. Python and Arduino), followed by hands-on tasks like machining, assembling, wiring, and soldering to put everything together. Finally, this project will involve testing the assembly on the bench and in cryogenic conditions.

This project is suitable for an enthusiastic student with interest in precision electronics and comfort with scripting and/or CAD design.