1. **Research Title:** Electron Transport in Semiconductor and Quantum Materials

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Electrical Engineering, Physics, Materials Science and Engineering (M .S. or Ph.D. Level)

4. **Objectives:** Development and characterization of electronic materials and structures to understand electron transport, scattering, including phase coherent quantum phenomena

5. **Description:**
Perhaps most famously with the discovery of the quantum Hall effect in Silicon MOS inversion layers, there has been a long and fruitful synergy of materials engineering, electronic device development, and fundamental condensed-matter physics studies. The development of high quality materials and heterostructures can lead to the discovery of new physics, and the application of well-understood condensed matter phenomena is a useful tool in the development of new material systems for specific applications. This topic seeks proposals working at this interface between applied electronic materials development and fundamental electronic transport study. Materials of interest include traditional semiconductors and their heterostructures, which exhibit phenomena including Shubnikov–de Haas oscillations and quantum Hall effect, as well as more novel materials such as topological insulators Weyl semi-metals, whose topologically protected states can be studied through phase coherent transport measurement. Novel spectroscopy techniques to study the physics of defects in dielectric materials and wide bandgap semiconductors are also of interest. Candidates should perform experiments in material growth, transport characterization, defect spectroscopy, first principles calculation, and/or quantum-mechanical transport/device modeling towards the development of materials and/or exploration of these phenomena.

6. **Research Classification/Restrictions:** Unclassified and without ITAR restrictions.

7. **Eligible Research Institutions:** Air Force Institute of Technology (AFIT); the University of Akron (UA); Bowling Green State University (BGSU); Central State University (CSU); the University of Cincinnati (UC); Cleveland State University (CSU); the University of Dayton (UD); Kent State University (KSU); Miami University (MU); The Ohio State University (OSU); Ohio University (OU); Shawnee State University (SSU); University of Toledo (UT); Wright State University (WSU); Youngstown State University (YSU); Case Western Reserve University (CWRU); and

Northeastern Ohio Medical University