



# Nanoscience and Nanotechnology



*Discover and exploit unique phenomena at nanometer dimensions to enable novel applications*

- **Enabled capabilities**

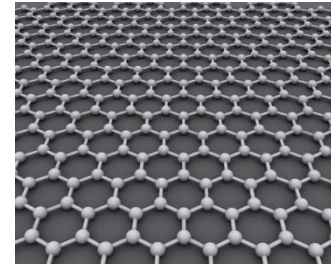
- Electronics & Sensing: Multi-spectral focal plane arrays, ubiquitous embedded sensors, curvilinear electronics, ultra-low voltage devices
- Power and Energy: Fuel-cells, portable electronics, mobile power, thermoelectrics
- Coatings: Photoactive, self-cleaning films

- **Select breakthroughs**

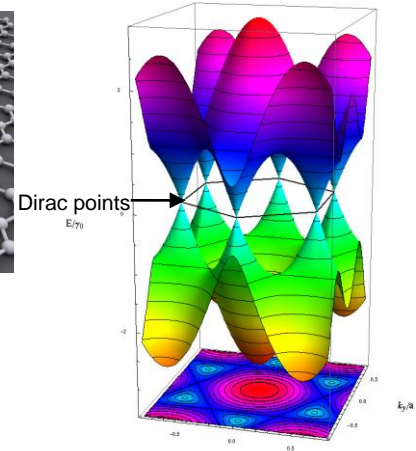
- Nano-particle coating & functionalization
- Catalysts for energy-harvesting
- Graphene and carbon nanotubes

- **Key research challenges**

- Low defect density graphene over large areas
- Production and reproducibility of single chirality nanotubes and bilayers of graphene, each layer individually biased to form new condensed state



Graphene monolayer



Graphene Bandstructure with Dirac points

