# SCIENTIFIC ACCOMPLISHMENTS:
# FUNDAMENTAL NANOSCALE PHENOMENA AND PROCESSES (PCA 1)

## Direct Measurement of Conductance of a Single Molecule

One of the primary challenges in understanding conduction phenomena in single molecules has been to develop a well-defined means for contacting a single molecule to individual sources and drains for electrons. A multidisciplinary team from the Nanoscience and Engineering Center (NSEC) for Electronic Transport in Molecular Nanostructures at Columbia University has developed a new method to wire molecules directly into nanometer-scale gaps in conducting single-walled carbon nanotubes (SWNTs). They have achieved this through precise oxidative cutting of a SWNT to produce carboxylic acid terminated electrodes separated by gaps of ≤10 nanometers. These point contacts react with molecules derivatized with amines to form covalent molecule bridges held in place by amide linkages. These chemical contacts are robust and have allowed the team to test conductance in a wide-variety of molecules. This concept can be used to explore a vast array of new conduction behaviors in single molecules with a wide variety of chemical structures.

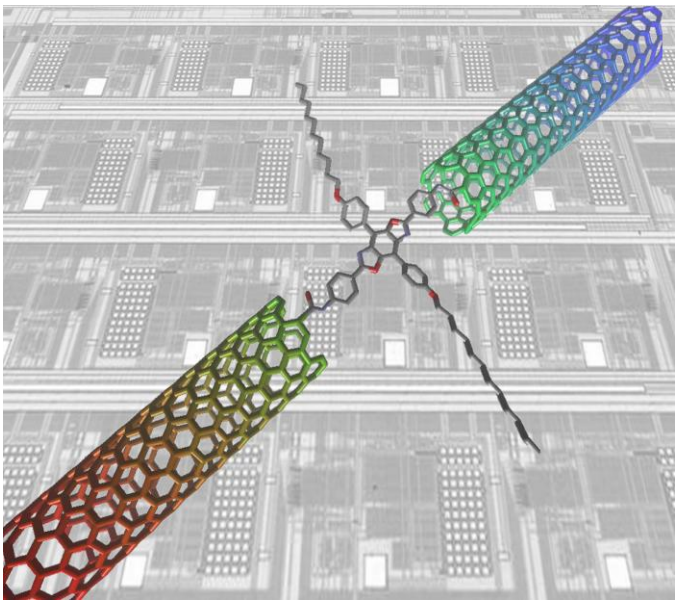

*Illustration of a new method to wire molecules directly into nanometer-scale gaps in conducting single-walled carbon nanotubes. Credit: Columbia University.*

Patents and other steps toward commercialization:

**Contributing Agencies: NSF and New York State Office of Science, Technology, and Academic Research (NYSTAR)**