INTRODUCTION
The Single-Molecule and Applied Spectroscopy Laboratory is interested in understanding fundamental and important processes occurring in Materials Chemistry, Polymer Physics, Nanotechnology and Biological Chemistry at the single-molecule level. We use single-molecule detection and applied spectroscopy techniques in our research and are constantly developing new techniques with greater sensitivity.

MATERIALS CHEMISTRY AND POLYMER PHYSICS[1, 2]
The effects of confinement on the properties of thin polymeric films are of great importance. However, the nature of such effects remains relatively unknown. Single-(macro)-molecule tracking via wide-field fluorescence microscopy is used to study fundamental physical processes such as crystallization, phase separation, wetting/dewetting of thin polymeric films. A better insight into the effects of confinement and substrate-polymer interaction is obtained by visualizing these processes in real-time.

BIOLOGICAL CHEMISTRY[3, 4]
In collaboration with Dr. Bengang Xing (CBC), we will tackle the problem of bacterial resistance against antibiotics. Single-molecule detection techniques such as wide-field microscopy, super-resolution imaging and fluorescence correlation spectroscopy are employed to understand the mode of interaction between antibiotic drugs and bacterial. This study will have important implications in drug design.

NANOTECHNOLOGY AND LIGHT-INDUCED MOLECULAR DEVICES[5, 6]
We are interested in understanding the driving force behind light-induced molecular devices at the single-molecule level. In particular, a pertinent question that the group wishes to address is the driving force behind the charge-recombination process found in solar cells.

Electron transport of the injected electron on TiO2 nanoparticle after its transfer from single Alito647 dye molecules encapsulated in cucurbit[7]uril gives rise to long-lived dark charge-separated states that are directly probed using the fluorescence intermittency of the emission intensity trajectories.

Wide-field microscopy images of a poly(ethylene oxide) sample maintained at 45°C for (a) 35 h, (b) 47 h, and (c) > 65 h.