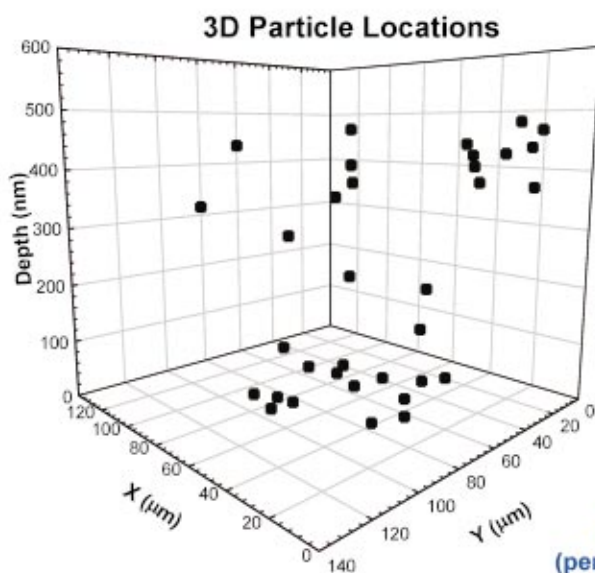


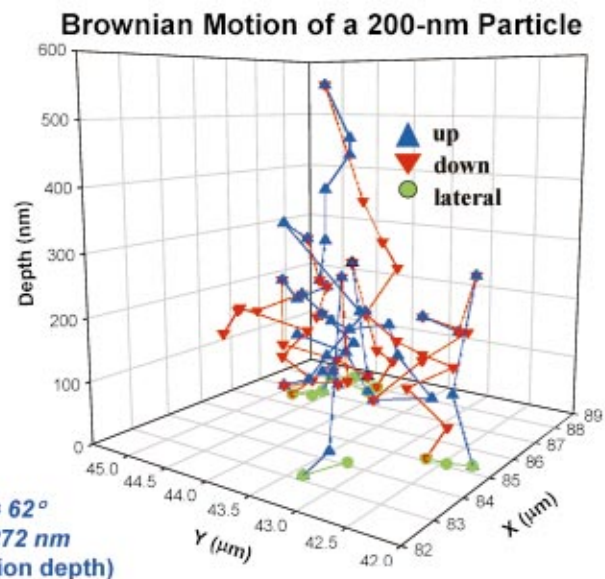
Regular Microscopy



Total Internal Reflection Microscopy



3D Particle Locations



Brownian Motion of a 200-nm Particle

## Three-Dimensional Tracking of Nanoparticles Using R-TIRFM\* Technique

A. Banerjee and K. D. Kihm

Micro/Nano-Scale Fluidics and Heat Transport Laboratory [<http://go.to/microlab>]  
Texas A&M University, College Station, Texas

The novel **Ratiometric-Total Internal Reflection Fluorescence Microscope\*** (R-TIRFM) imaging technique enables nano-particle tracking in the line-of-sight ( $z$ ) direction with a nanometer spatial resolution. The digital tracking of the particle image centers on the  $x$ - $y$  plane provides its lateral locations with the spatial resolution equivalent to the CCD pixel dimensions. An oil immersed TIRF lens (60X, NA=1.45) is used to track 200-nm fluorescent micro-sphere tracers illuminated by an argon-ion blue laser. The technique is the first of its kind to tag and track nano-particles with nanometer spatial resolutions in a full three-dimensional way. This work was partially sponsored by the NASA-Fluid Physics Program Grant No. 3-2712 and partially by the USDOE/Argonne National Laboratory Grant No. DE-FG02-04ER46101.