

## New Nano Tools for Real-time and Single-Molecular Imaging of Single Live Cells

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[www.odu.edu/sci/xu/xu.htm](http://www.odu.edu/sci/xu/xu.htm);

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Single live cells comprise dynamic and complex molecular machineries that are constantly changing over time and space. To fully understand their functions, it is essential to quantitatively and simultaneously image the network of molecules in single live cells with spatial and temporal resolutions. Currently, fluorescence microscopy is the primary workhorse for live cell imaging. Fluorescence probes (fluorophor, fluorescence protein, QD) suffer intrinsic photobleaching, making quantitatively and continuously capture the dynamic events of the same single live cells over time impossible. Requirement of separation of different excitation and emission of various fluorophores also restricts its multiplexing capability. To overcome these challenges, we have developed a set of powerful new tools, including rainbow-colored photostable single nanoparticle plasmonic probes, photostable **single molecule nanoparticle optical biosensors** (SMNOBS) and super-resolution photostable optical nanoscopy (PHOTON). We have demonstrated that these powerful new nanobiotechnologies and new imaging tools can be used to study interactions of nanomaterials with living organisms for rational design of biocompatible nanomaterials and to address a wide range of vital biological questions, including better understanding of cellular membrane transport and signaling transduction pathways, differentiation of embryonic stem cells, and neuron-neuron communication. The work is supported by NSF (CBET 0507036 & 1450936) and NIH (R01GM0764401 & R21 HL127580).

### A Brief Biography



**Dr. X. Nancy Xu** is AAAS Fellow and professor of chemistry and biochemistry at Old Dominion University. Dr. Xu has directed NSF and NIH funded nanoscale interdisciplinary research program, and developed cutting-edge nanobiotechnologies including rainbow-colored photostable single nanoparticle probes, single molecule nanoparticle optical biosensors, and photostable optical nanoscopy (PHOTON) for molecular imaging of single live cells at nm scale in real time. Dr. Xu is the recipient of both 2008 Nano 50 Innovator award and 2007 Nano 50 Technology award.