Oct 25th, 3:00 PM - 5:00 PM

Nano-Optics: Light, Matter, and Single-Molecule Imaging

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Abstract

Light and matter interact in fascinating ways at the nano-scale, allowing scientists to image, probe, analyze, or manipulate single molecules. This interdisciplinary field has opened the doors to a vast array of insights and applications, including single-molecule sensors, advanced photonic devices, and novel forms of imaging. This poster summarizes work done at Bethel over the past few years in the areas of nano-imaging, nano-sensing, and nano-manipulation.

Introduction to Nano-Optics

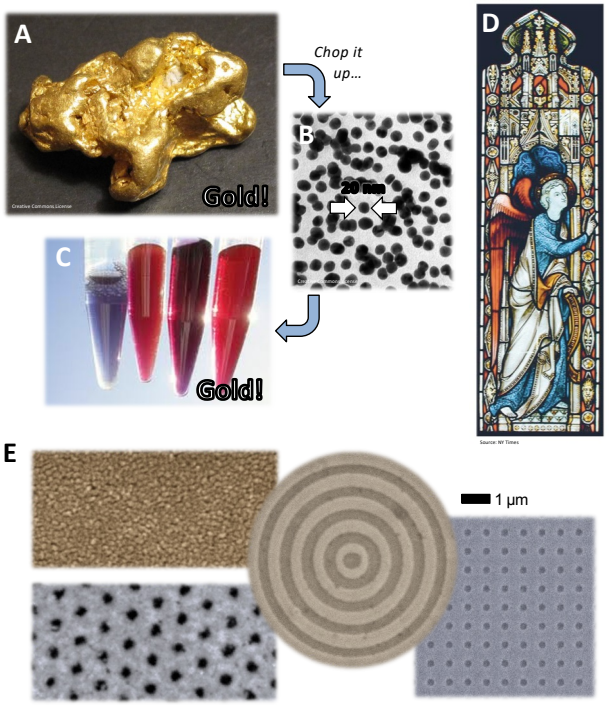

Figure 1: Nano is **small** and nano is **different**. (a) Photo of a gold nugget. (b) Image of gold nanoparticles. (c) Gold nanoparticles appear a range of red, depending on the size. (d) Medieval stained glass gets its red color from gold nanoparticles. (e) Various gold and silver nano-structures studied at Bethel.

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These novel optical properties can be studied and used for multiple applications. In Bethel's Nanotechnology Lab we have projects related to nano-sensing, nano-imaging, and nano-manipulation.

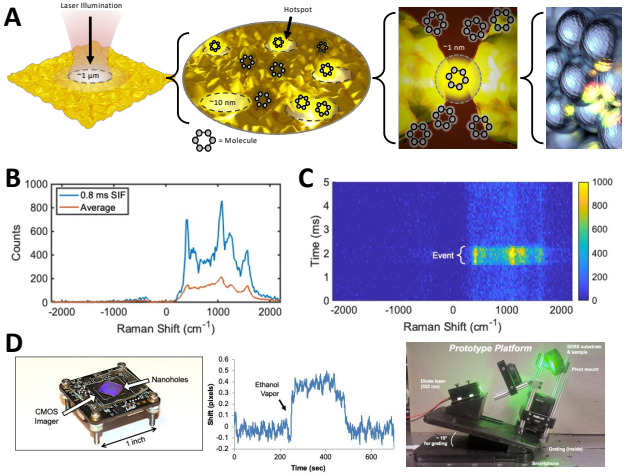

Figure 2: Nano-sensing. (a) Laser light focused into atom sized volumes called "hotspots." (b) The peaks in a "Raman spectrum" will fingerprint a specific molecule. (c) Examining signals in time gives a clue to molecular dynamics at over 100,000 spectra per second. (d) Vapor and chemical composition sensing with a smartphone.

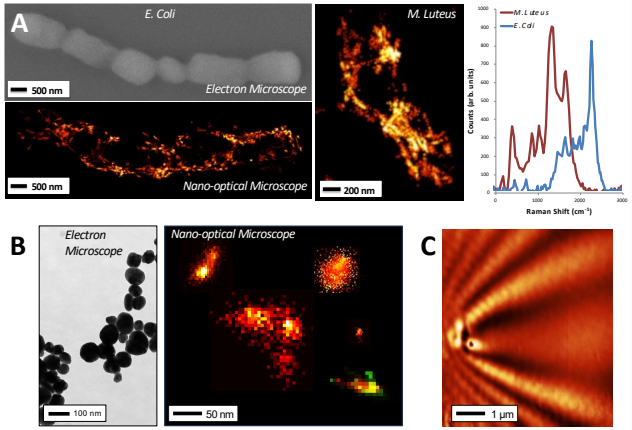

Figure 3: Nano-imaging. (a) Seeing bacteria with nano-scope. (b) Imaging single molecules on nanoparticles. (c) Nano-holograms.

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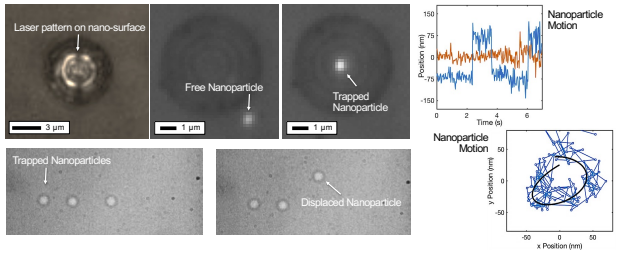

Figure 4: Nano-manipulation. Using patterned laser beams illuminating patterned nano-surfaces, we manipulate nanoparticles.

Papers Published with Students

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