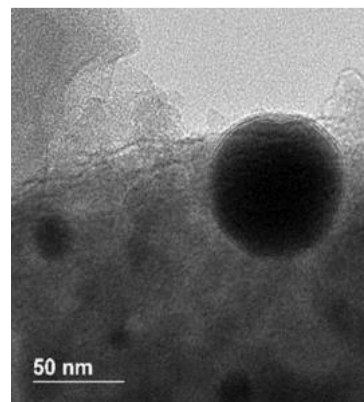


Nanotechnology and Environmental Remediation: Dr. Dungey's Lab

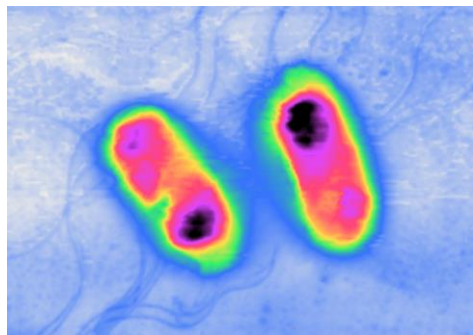
Nanotechnology, the manipulation of matter at the nanometer scale, produces new effects not seen in bulk materials (Atkinson 2003).

Project 1: Nanoparticles for Environmental Remediation

Nanoparticles are effective catalysts due to their large surface area to volume ratios. Due to these enhanced properties, nanoparticles are being explored for environmental remediation applications. Our approach to nanotechnology is to use environmentally benign materials, prepared using green chemistry principles (ACS). In particular, we are using Zero-Valent Iron Nanoparticles (nZVI) to enhance bacterial denitrification in agricultural soils (Kerr and Dungey 2019). Excess nitrates in agricultural fields are pollutants and should be reduced to prevent degradation of environmental waters (lakes, rivers, oceans). We will measure denitrification rates of bacteria cultures as a function of nanoparticle preparation and support material. Students will learn ion chromatography in order to separate nitrate peaks from background and quantify the denitrification process.



Project 2: Atomic Force Microscopy for Imaging Biological Samples



Biological structures are related to their function, so measuring biological samples at the nanoscale can increase our understanding of biological processes. In collaboration with Dr. Sanchez-Diaz (Biophysics, UTC), students will use the atomic force microscope (AFM) to study the physical changes to bacterial cells grown in the presence of antibiotics.

ACS. "12 Principles of Green Chemistry." American Chemical Society, from <https://www.acs.org/content/acs/en/greenchemistry/principles/12-principles-of-green-chemistry.html>.

Atkinson, W. I. (2003). Nanocosm. New York, Amacom.

Kerr, N. and K. Dungey (2019). Using Green Chemistry to Produce Supported Iron Nanoparticles from Oak Leaf Extract and Biochar. National Conference of Undergraduate Research, Kennesaw, GA, University of North Carolina at Asheville.