

# Understanding the Interaction of Nanomaterials with DNA, Proteins, and Cells

Payne Lab  
Duke University  
Department of Mechanical Engineering and Materials Science and  
Department of Chemistry

The Payne Lab is recruiting PhD students and postdocs for the following projects:

**1. Understanding the interaction of DNA with nanoparticles with applications in autoimmune diseases.** This project includes nanoparticle characterization (TEM, DLS), measurement of DNA concentration, live cell imaging, and cellular assays to measure cytokine release. The research is carried out in close collaboration with Dr. David Pisetsky, a clinician-scientist and expert in lupus at Duke's School of Medicine.

**2. Use of machine learning to predict the interaction of proteins with nanoparticles.** This research includes the use of nanoparticle characterization (TEM, DLS), lab automation (Python), proteomics, and machine learning. Previous experience in one of these areas is useful: It is not expected that a student or postdoc will have expertise in all.

**3. Pulmonary response to the inhalation of nanomaterials.** Much human exposure to nanomaterials occurs via inhalation, especially in manufacturing and agricultural settings. We are working to understand how nanomaterials (TiO<sub>2</sub> and MWCNTs) interact with lung fluids and how cells respond to these lung fluid-nanomaterial complexes. *In vivo* experiments are carried out in collaboration with Dr. Robert Tighe, a pulmonologist at Duke's School of Medicine and with Prof. James Bonner, a nanotoxicologist at NC State University.

Applicants with undergraduate or graduate degrees in **Materials Science, Chemistry, Physics, Mechanical Engineering, Chemical Engineering, and related fields** are encouraged to contact Prof. Christine Payne for more information. PhD applicants can apply through Duke's Department of Mechanical Engineering and Materials Science or Department of Chemistry. Duke PhD students are fully funded (\$38,600 + tuition and fees) and have the opportunity to do an industry, national lab, or non-profit/policy internship during their PhD.



Payne Lab information:

<https://mems.duke.edu/faculty/christine-payne>

<https://scholar.google.com/citations?user=2QTf8DEAAAAJ&hl=en>