Probing Structural Dynamics with High Spatial and Temporal Resolution

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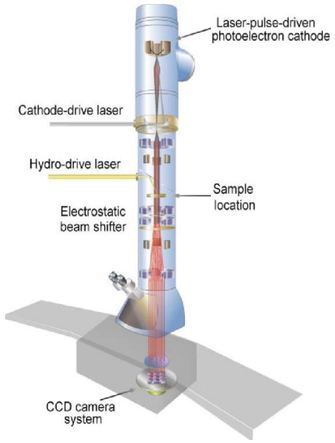
NEW

Research Team: Nigel Browning, James Evans (PNNL and University of California-Davis)
Key Collaborators: Bill Ristenpart, Roland Faller, Katie Jungjohann, David Welch, Taylor Woehl, Pinghong Xu (UC-Davis)

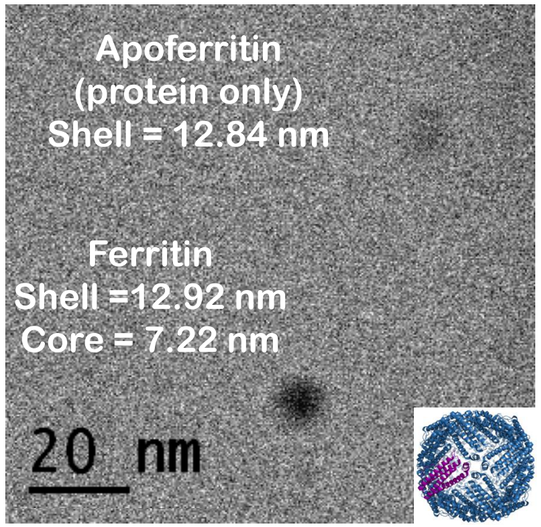
Purpose

Understand the structural dynamics in biological and/or nanomaterials systems on the μs to ns timescale.

This research will use a unique aberration-corrected Dynamic TEM (DTEM), where a photoemission source will enable time-resolved images at/near atomic resolution.



A short pulse laser creates the beam, leading to high spatial and temporal resolution images in DTEM



Bio-Processes

The DTEM approach for bio-structures will be optimized to see "live" snapshots with better than nm and ns spatio-temporal resolution. Images will have resolution 5-8 orders of magnitude better than current methods. This can generate new levels of understanding in normal and abnormal cellular processes.

Expected Outcomes

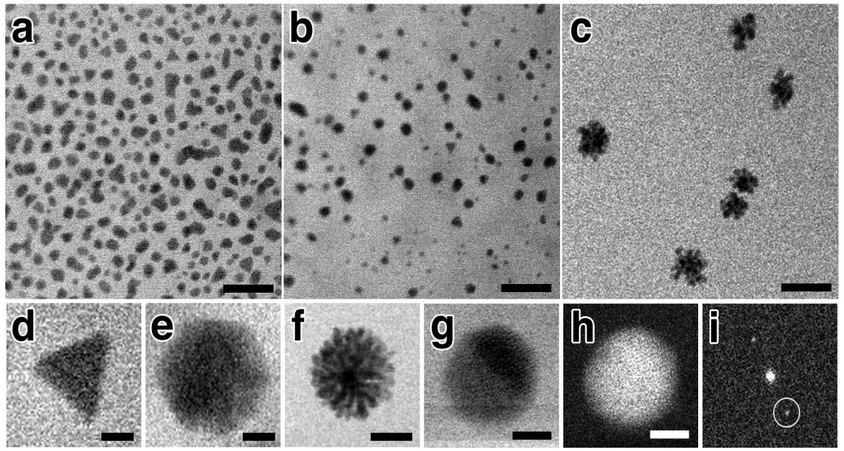
Develop single-shot imaging with atomic spatial resolution for DTEM with *in situ* gas and liquid stages.

Test the overall limits in spatio-temporal resolution for future ultrafast TEM designs.

Develop the capability for imaging biological structures in their "live" hydrated state.

Nanoparticle Growth

Using the DTEM to control the electron dose and to initiate the reaction in a liquid stage, we can observe the initial stages of nucleation and growth. Once the nuclei have been formed, the complex solid-liquid interactions in the nanoparticles and the interactions of the nanoparticles with electrode surfaces can be studied directly.



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