

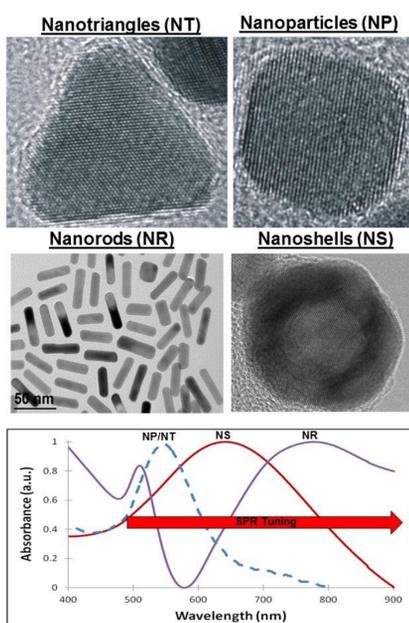
**S&T Campaign: Materials Research
Manufacturing Science
Energy Coupled-to-Matter**

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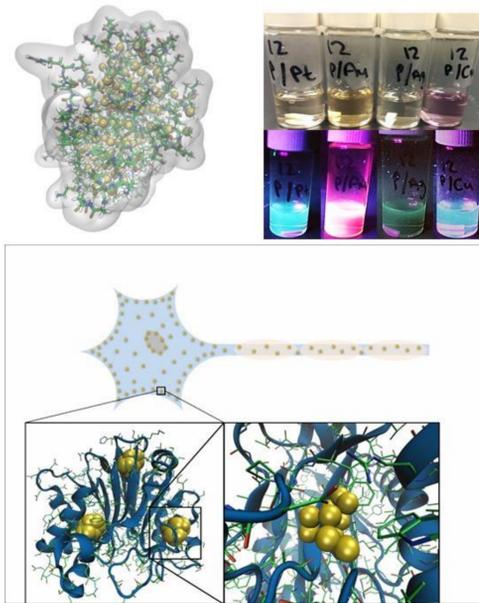
Research Objective

- Synthesize and apply highly uniform, optically tunable nano and bio-nano materials in multiple spectral regions with tailorable absorption/reflectance/emission profiles.
- Create new multi-functional material concepts and develop material processing strategies for integration into nanocomposites while maintaining functionality.

Nanoplasmonics



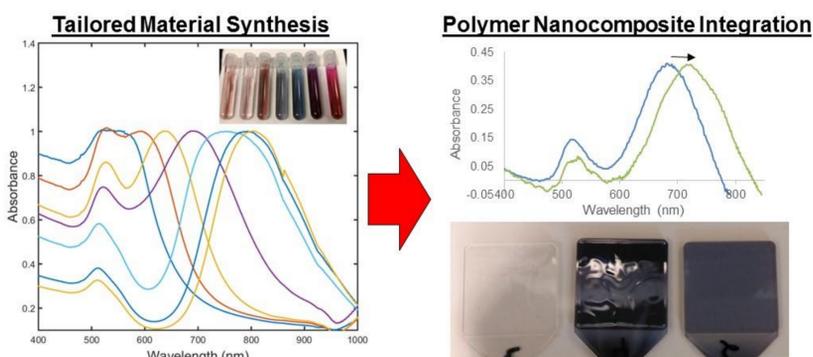
Bio-Nano Photonics



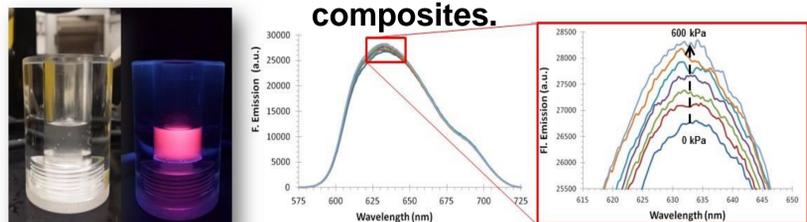
Nanoplasmonic materials tuned across optical spectra based on morphology and aspect ratios (left). Protein-nanocluster hybrid photonic materials and their direct growth within neuronal cells (right).

Challenges

- Maintaining full material functionality following harsh composite processing procedures.
- Control of material alignment/orientation within nanocomposite structure.
- Precisely controlling nanocomponents within host biomaterials.



Extrusion processing of tailored nanorods into polymer composites.

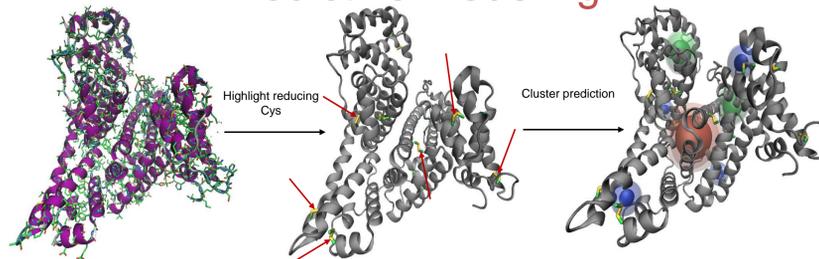


Fluorescent pressure response of protein-nanocluster hybrids in a brain-mimicking polymer composite.

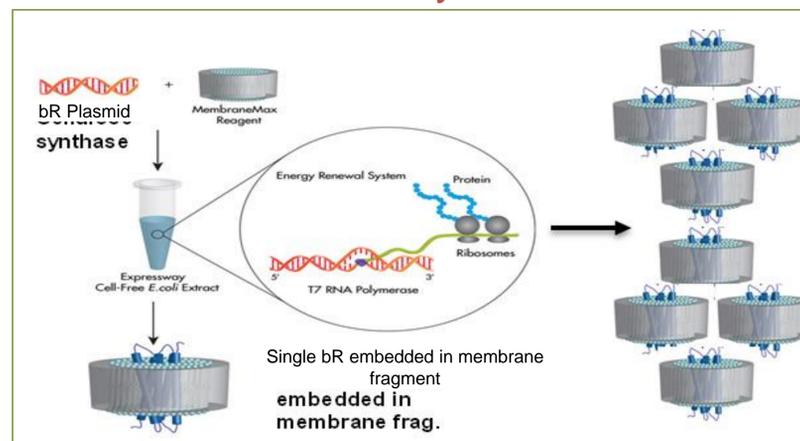
ARL Facilities and Capabilities Available to Support Collaborative Research

- Facilities to produce bio-nano materials from cloning to the full bevy of nanomaterial characterization (TEM, XPS, FT-IR, UV-Vis, DLS, Zeta-analyzer).
- Predictive modeling: Simulation workflow in process to determine nanomaterial stabilization sites within biomolecules.
- Specialize in nanomaterial incorporation into energy coupling biological systems (Patent 8-551-407).

Predictive Modeling



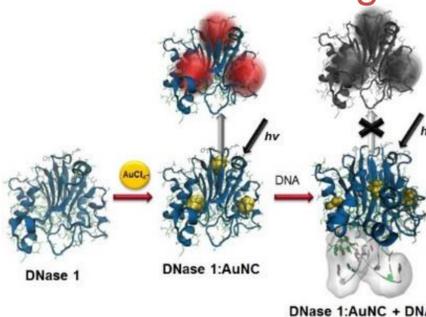
Cell Free Systems



Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Hierarchical patterning techniques.
- Crystallographic analysis.
- Mass spectrometry core.
- Expertise in bottom-up macroscale assemblies.
- Electromagnetic interaction modeling.

Biosensor Designs



Hybrid Composites

