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Biomaterials:

Next Generation Sensing to Living Materials

U.S. ARMY RDECOM

ARL open campus

S&T Campaign: Materials Research
Biological & Bioinspired

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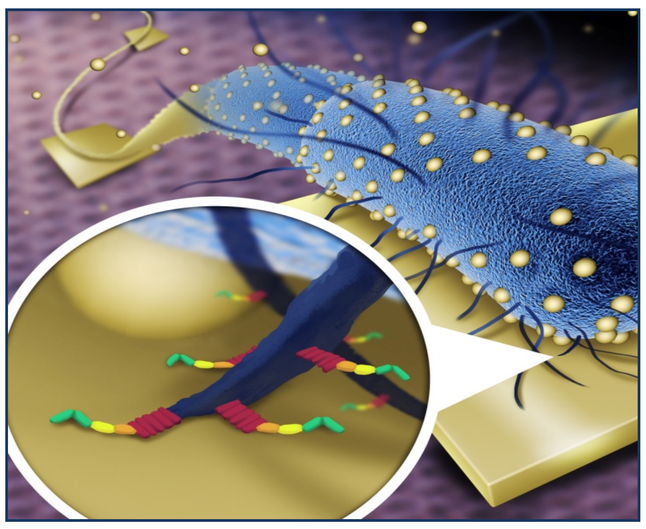
Research Objective

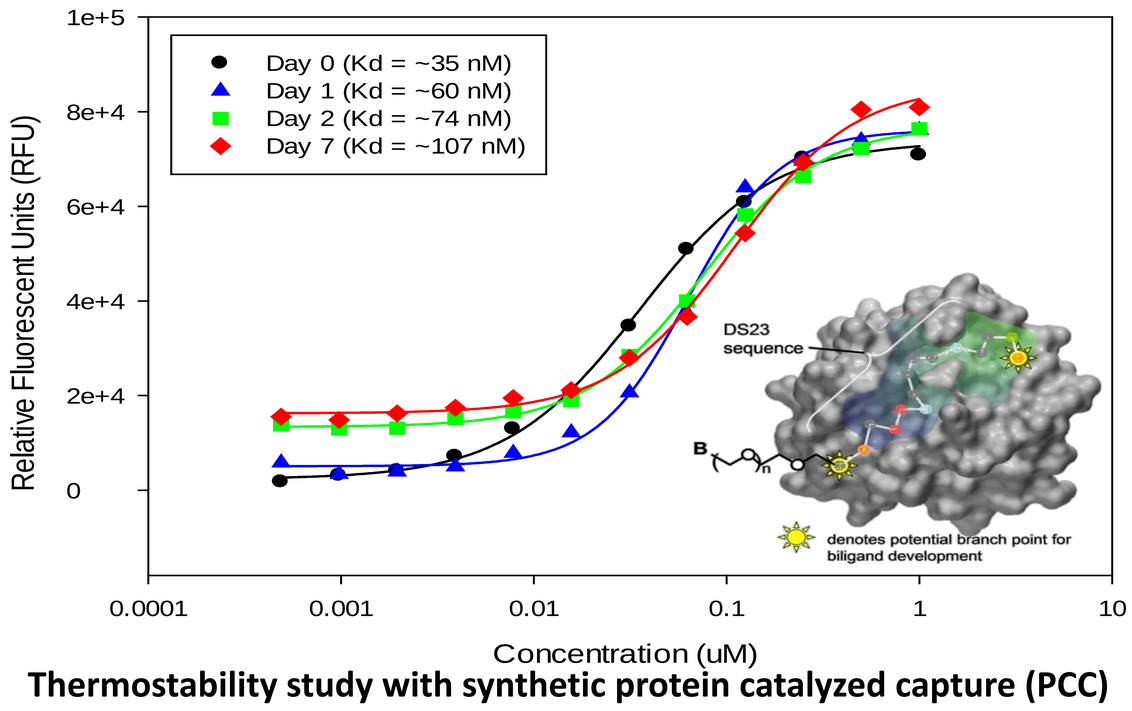
- **Discover functional biomaterials -stable in austere military environments including temperature extremes**
- **Develop comprehensive discovery tools understanding interactions and predicting enhanced performance**
- **Extend capabilities to program hard-soft interface (i.e., bio/abio) for materials with increasing functional complexity**



Conceptual diagram of self-healing living bacterial wire

Challenges

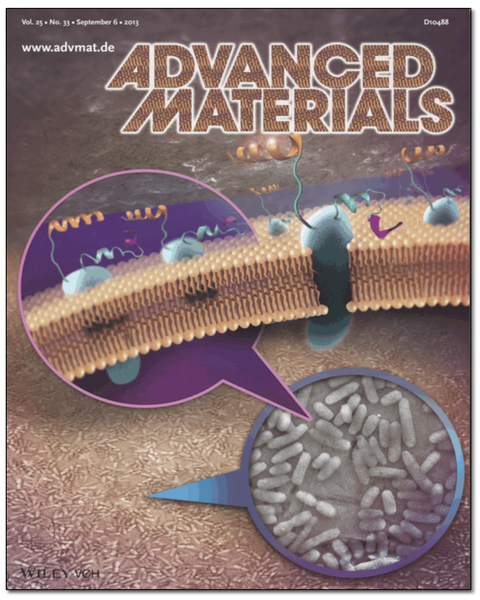
- **Limited understanding of complex interactions, and control of biointerfaces**
- **Functional biomaterials in austere environments including temperature and other degradation pathways**
- **Current antibody reagents limited by manufacturing, shelf-life, and stability preventing ubiquitous sensing**



Thermostability study with synthetic protein catalyzed capture (PCC) peptide to protective antigen showing retention of function after 7 days of exposure to 70°C.

ARL Facilities and Capabilities Available to Support Collaborative Research

- **Facilities & expertise for discovery, custom engineering, and study of peptides via bacterial cell surface display**
- **Genetically engineered peptides for inorganics, hybrid biomaterials, and living material system interfaces**
- **Specialized modeling and simulation tools for bio-bio and bio-abio interactions, using secure DOD High Performance Computing Facilities**



- **Specialized modeling/simulation tools for bio-bio and bio-abio interactions, using secure DOD High Performance Computing Facilities**
- **Specialized tools and methods for synthetic peptide technology include synthesis of combinatorial libraries and non-natural incorporation**
- **Development of extremely stable (protease resistant, extreme thermostability), and highly manufacturable peptide reagents for biosensing**

Recent related ARL Publications

"A Chemically Synthesized Capture Agent Enables the Selective, Sensitive, and Robust Electrochemical Detection of Anthrax Protective Antigen", *ACS Nano*, **2013**, 7 (10), pp 9452–9460.

"Genetically Engineered Peptides for Inorganics: Study of an Unconstrained Bacterial Display Technology and Bulk Aluminum Alloy" *Adv. Mater.*, **2013**, 25 (33), 4530.

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **New material and application areas of mutual interest in peptide material discovery**
- **Biofilm expertise to collaborate on switchable cell adhesion studies**
- **Collaborations in living materials (e.g., living paints, anti-corrosives, self-healing materials)**
- **Collaborations in device research and microfluidics for single cell studies, and cell isolation and study (cell sorting)**
- **Collaborations in peptide-driven assembly ; synthesis ; sensing platforms**
- **Postdoctoral researcher(s), students, visiting scientist opportunities**

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