Postdoc Fellowship at Yale in Bacterial Electron Transfer via Protein Nanowires

Postdoc fellowship is immediately available in the laboratory of Prof. Nikhil Malvankar in the Molecular Biophysics & Biochemistry Department and interdisciplinary Microbial Sciences Institute at the Yale University's new West Campus. Lab: http://malvankarlab.yale.edu/

Our overarching goal is to define the mechanisms by which microbes interact with and manipulate their environment, with the ultimate goal of engineering these interactions to control microbial pathophysiology and ecology. Our research is focused on how electricity-producing microbes use electron transfer via hair-like protein appendages as "nanowires" (*Cell* 2019) for communication (*Science* 2010), and biofilm formation (*Nature Nano* 2011), allowing bacteria to survive in environments that lack membrane-permeable electron acceptors such as oxygen. Our discovery of protein nanowires offers fundamentally new method to synthesize materials that can transport charge/energy at rates/distances unprecedented in molecules; helps to explains a wide range of globally-important processes; and offer insights into bacterial survival mechanisms.

The postdoc will work on one or more of the following four major research themes of our lab:

1) Protein Structure: We recently solved the structure of nanowires that revealed a surprise that nanowire have a core of hemes that line up to create a continuous path for electrons (*Cell* 2019). Previously nobody suspected such a structure. We are now identifying the nanowire assembly machinery using x-ray crystallography and cryo-electron microscopy and tomography.

2) Conductivity Mechanism: Existing models of biological electron transfer cannot fully explain such high conductivity in proteins. We are building a new fundamental framework by performing conductivity measurements as a function of several physical and chemical probes.

3) Synthetic Protein Nanowires: We are incorporating natural and non-standard amino acids in protein nanowires to develop electronically and optically functional biomaterials.

4) Bacterial infections: Most bacteria cannot cause diseases without pili. In collaboration with Yale Cystic Fibrosis Center, we are evaluating how bacterial electron transfer helps adhesion to the host as well as iron & sulfur metabolism using *Pseudomonas aeruginosa* as a model system.

We are looking for candidates with expertise in one of the following: site-directed mutagenesis, electron transfer in proteins or conducting polymers, membrane protein purification; cultivation of BSL2 level bacterial pathogens and their mammalian host cells. This experimental position also presents extensive collaborative opportunities with computational and clinical scientists.

The candidate is expected to have a PhD degree or equivalent. Our research is multidisciplinary, and we encourage candidates from different backgrounds. Applicants should be highly self-motivated and have potential to become independent researchers in academia or industry.

Candidates should send an email to postdoc@malvankarlab.org with the following materials (submitted as one combined PDF file):

1. A cover letter (no longer than 2 pages) describing your past and present research projects as they relate to above research in our lab and your career goals.

2. A document (no longer than 1 page) describing how you plan to contribute to our lab.

3. CV.

4. Contact of 3 references, including phone and email. Describe your connection with them.