New NIST Cooperative Agreement: <u>Center for Neutron Science at the University of Delaware: Neutron Metrology for Solving Grand Challenge Problems by Engineering the Tools of Scientific Discovery</u>

Award #: 70NANB20H133: Department of Commerce, 9/1/2020-8/31/2025; $ 4,734,024

PIs: *Norman Wagner, Paramita Mondal, Eric Furst, Susana Marujo Teixeira*

Project Summary:

This cooperative agreement between the Center for Neutron Science (CNS) at the University of Delaware (UD) and the NCNR for the purpose of advancing neutron scattering metrology for research and by using this neutron science to address the following NAE Grand Challenge Problems: *Engineering Better Medicines, Restore and Improve Urban Infrastructure*, and *Engineering the Tools of Scientific Discovery*. The goals of this cooperative agreement include the promotion and development of the use of neutron scattering science by scientists at the NCNR, NIST and the broader community in science and engineering, including macromolecular, colloid, and condensed matter science and materials chemistry. The three University faculty, two NIST scientists, NIST software engineer, NIST postdoc, two UD doctoral students, and undergraduate researcher to be supported by this cooperative agreement with the CNS have significant, collective experience using neutron scattering in research, and in the design, development, maintenance and optimization of neutron scattering instrumentation. The staff to be supported under this cooperative agreement have distinguished accomplishments at the NCNR, making significant contributions to the NCNR's new data acquisition software (NICE), the development of Rheo-SANS and HPSANS, as well as significant scientific advances in soft matter using NCNR resources. The beamline scientists will support the SANS, USANS, and VSANS instruments. The computer scientist supports NICE and the computational infrastructure of the NCNR more broadly. This proposal also includes a novel collaboration with NCNR staff to develop new sample environments for ***high-pressure SANS with concurrent diffusing wave and light scattering***, as well as new, ***stop-flow experiments to study materials chemistry kinetics*** that will be available to the broader user community.

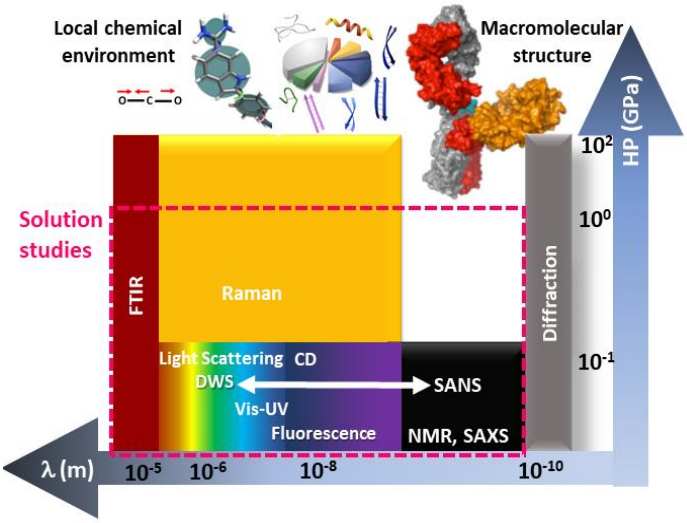

Figure 1. HP techniques used to provide structural information from the local chemical environment to direct macromolecular arrangements using various wavelengths (λ). The area highlighted in pink is relevant for solutions of biopolymers (above 2000 MPa, pressure can break chemical bonds). Techniques that use radiation with larger λ infer bulk properties from averaged local chemical environment effects, while single molecule techniques such as SANS, SAXS or NMR measure macromolecular dimensions in solution.