RX19-5

Attachment 1- Research Topic Template

1. **Research Title:** Advanced biomaterials characterization techniques at the interface of structural biology and materials

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**

Biology, Biomedical Engineering, Materials Science (MS or PhD level)

4. **Objectives:** Provide a more complete understanding of biological systems and biomaterials by advancing the state of the art for characterization of biological materials and biomolecular interactions with other biomolecules, nanoparticles, and surfaces.

5. **Description:** Biologically based materials and devices are of growing interest for a wide array of potential technologies ranging from personalized medicine to sensing to artificial vision. The structure and dynamics of biomolecules on surfaces, for example, can strongly influence the resulting properties of a device. Cutting edge characterization techniques, such as cryo- and liquid cell electron microscopy, and X-Ray synchrotron techniques (footprinting, scattering and spectroscopy), are widely used in biological science and materials science, respectively, however techniques that bridge the soft-hard interface reliably have remained elusive. This research opportunity will focus on developing and applying cutting edge characterization tools to biologically-based materials of Air Force relevance. These may include, but are not limited to, structural proteins with embedded functionality, proteins such as enzymes or antibodies on surfaces, DNA- or peptide-functionalized nanoparticles. In-situ and in-operando tools will also be of interest as they have a significant potential to accelerate development of new materials. Complimentary techniques to X-Ray footprinting, discussed above, such as amino acid labeling, are also of interest.

6. **Research Classification/Restrictions:** This opportunity is unclassified, open to US citizen students only.