

1. **Research Title:** Bioinformatics and Synthetic Biology for Biomaterials
2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** Microbiology, (Bio) informatics, Biology, Biochemistry, Bioengineering (BA/BS, MS or PhD level)
4. **Objectives:** Use state-of-the-art 'omics tools and bioinformatics (including AI/ML) to predict activities of microbial communities from extreme ecosystems or other Air Force relevant environments. Engineer identified enzymes/pathways to biologically manufacture materials that are responsive to Air Force (AF) requirements.
5. **Description:** Microorganisms, including bacteria and fungi, can inhabit AF materials and other built environments. These environments are often dry or deplete in carbon requiring microorganisms to be hardy in order to survive. Beyond the built environment microorganisms live in extreme ecosystems such as hot springs, hyperalkaline lakes and more, again requiring a hardy metabolism to survive and propagate. Employing -omics tools, such as genomics (DNA), transcriptomics (RNA), or proteomics (protein) would elucidate what enzymes these microorganisms harbor and produce under certain conditions (e.g., Under high temperatures or nutrient limitations). The use of multi-omics tools results in large amounts of data which are analyzed using sophisticated computational tools and software and on high computing clusters. This research opportunity will focus on integrating state-of-the-art -omics and bioinformatics of selected AF microorganisms and microbial communities to predict their activities and subsequently engineer their enzymes and pathways for materials production.
6. **Research Classification/Restrictions:** The research project is unclassified, open to US citizen students only.
7. **Eligible Research Institutions:** Ohio state universities