

1. **Research Title:** Synthetic Biology of Biomaterials Production

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Synthetic Biology, Biological Engineering, Microbiology, Biochemistry, Genetics (BA/BS, MS, or PhD level)

4. **Objectives:**

- a. Use contemporary bioinformatics, synthetic biology, and/or biochemistry strategies to identify relevant biological characteristics of bacteria involved in microbially induced calcium carbonate precipitation (MICP or biocementation).
- b. Investigate and develop strategies for manipulating organism biology to improve MICP capabilities.

5. **Description:** Environmental microbes regularly participate in ecological mineral cycling. We have developed a strategy to harness microbial mineralization, namely MICP, for Air Force applications. However, the workhorse microbes for commercial MICP are drastically understudied. Current evidence, although minimal, strongly suggests that novel physiologies are involved, but little research in the community is actively investigating the details of the novel physiologies. To improve MICP, we are interested to better understand the contributions of known and novel physiological characteristics of the microbes involved in MICP. In collaboration with applicants, we will collect and use genomic and transcriptomic data to build hypotheses that we can test using an array of informatics, biological/biochemical, and genetic techniques. The collaboration will begin by sharing physiological data that Air Force researchers have already collected and progress through integrated efforts among the applicants, Air Force researchers, and other academic and industry partners to establish which physiological properties enable optimal MICP.

6. **Research Classification/Restrictions:** The research project is unclassified, open to US citizen students only

7. **Eligible Research Institutions:** Universities in the state of Ohio

8. **PA Approval #:** Distribution A: Approved for public release. Distribution unlimited.  
AFRL-2024-4608