

**Title:** Leveraging Simulated Microgravity for Material Design and Investigation of Peptide-Inspired Materials

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**Project Summary:** Achieving long-range ordering and accessing novel material states is a central priority for materials design, as these properties underpin the performance of a wide range of future technologies. Specifically, this project explores the utilization of ground-based gravitational emulation platforms to direct the synthesis of adaptable, bio-inspired materials. This strategy effectively harnesses a simulated weightless environment to eliminate density-driven interference, enabling the production of supramolecular networks and unique architectures that are impossible to manufacture under standard Earth conditions. However, optimizing this synthesis is challenging due to i) the lack of predictive models for weightless chemistry, ii) the vast design space of chemical sequences, and iii) the difficulty of validating results without continuous access to space. The goal of this project is to employ data-driven methods and new tools, such as computer vision for chemistry, to establish a framework for engineering advanced supramolecular materials.