Human exploration off planet is severely limited by the cost of launching materials into space and re-supply. Thus materials brought from earth must be light, stable and reliable at destination. Using traditional approaches a lunar or Mars base would require either transporting a hefty store of metals or heavy manufacturing equipment and construction materials for *in situ* extraction; both would severely limit any other mission objectives. Long-term human space presence requires periodic replenishment, adding a massive cost overhead. Even robotic missions often sacrifice science goals for heavy radiation and thermal protection.

Biology has the potential to solve these problems because it can replicate and repair itself, and do a wide variety of chemical reactions including making food, fuel and materials. Synthetic biology can greatly enhance and expand life's evolved repertoire. Using natural and synthetically altered organisms as the feedstock for additive manufacturing could one day make possible the dream of producing bespoke tools, food, smart fabrics and even replacement organs on demand.

To this end our lab has produced a proof-of-concept bioprinter with nearly one-cell resolution. Genetically engineering yeast cells to secrete bioproducts subsequent to printing allows the potential to make biomaterials with a fine microstructure. Imagine a production system that, at a few micron scale resolution, can add mollusk shell for compressive strength per unit mass, spider silk or collagen for tensile strength per unit mass, and potentially biologically-deposited wires. Now imagine what new products can be enabled by such a technology, on earth or beyond.