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Title: biOrigami: A New Approach to Reduce the Cost of Space Missions

Abstract: Space exploration lies at the inquisitive core of human nature, yet high costs hinder the advancement of this frontier. We are harnessing the replicative properties of biology to create biOrigami—biological, self-folding origami—to reduce the mass, volume, and assembly time of materials needed for space missions. biOrigami consists of two main components: manufacturing substrates biologically and bioengineering folding mechanisms. For substrates, we are developing new BioBricks to synthesize two thermoplastics: polystyrene and polyhydroxyalkanoates. For folding mechanisms, we are using heat-induced contraction of thermoplastics and the contractile properties of bacterial spores. After consulting with experts, we believe that biOrigami could be incorporated into rovers, solar sails, and more. In addition to biOrigami, we are creating a novel method to efficiently transform bacteria by using the CRISPR/Cas9 system, benefitting the broader synthetic biology community. Our project integrates and improves manufacturing processes for space exploration on both the micro and macro levels.