On beyond Star Trek, The Role of Synthetic Biology in NASA's Missions (USQ, July 2016)

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The time has come to for NASA to exploit the nascent field of synthetic biology in pursuit of its mission, including aeronautics, earth science, astrobiology and notably, human exploration. Conversely, NASA advances the fundamental technology of synthetic biology as no one else can because of its unique expertise in the origin of life and life in extreme environments, including the potential for alternate life forms. This enables unique, creative "game changing" advances. NASA's requirement for minimizing upmass in flight will also drive the field toward miniaturization and automation. These drivers will greatly increase the utility of synthetic biology solutions for military, health in remote areas and commercial purposes. To this end, we have begun a program at NASA to explore the use of synthetic biology in NASA's missions, particularly space exploration. As part of this program, we began hosting an iGEM team of undergraduates drawn from Brown and Stanford Universities to conduct synthetic biology research at NASA Ames Research Center. The 2011 team (http://2011.igem.org/Team:Brown-Stanford) produced an award-winning project on using synthetic biology as a basis for a human Mars settlement and the 2012 team has expanded the use of synthetic biology to estimate the potential for life in the clouds of other planets (http://2012.igem.org/Team:Stanford-Brown; http://www.calacademy.org/sciencetoday/igem-competition/). More recent projects from the Stanford-Brown team have expanded our ideas of how synthetic biology can aid NASA's missions from "Synthetic BioCommunication" (http://2013.igem.org/Team:Stanford-Brown) to a "Biodegradable UAS (drone)" in collaboration with Spelman College (http://2014.igem.org/Team:StanfordBrownSpelman#SBS%20iGEM) and most recently, "Self-Folding Origami" (http://2015.igem.org/Team:Stanford-Brown), the winner of the 2015 award for Manufacturing.