

## From Earth to ET: the use of synthetic biology for NASA's missions



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### Abstract:

Synthetic biology – the design and construction of new biological parts and systems and the redesign of existing ones for useful purposes – is transforming fields from fuels to pharmaceuticals and beyond. Our lab has pioneered the potential of synthetic biology to revolutionize two areas of interest to NASA: astrobiology and as an enabling tool for exploration. Synthetic biology is allowing us to answer whether the evolutionary narrative that has played out on planet Earth is likely to have been unique or universal. For example, in our lab we have re-evolved the biosynthetic pathways of amino acids in order to understand potential capabilities of an early organism with a limited repertoire of amino acids. And what about the limits for life? Can we create organisms that expand the envelope for life, for example, radiation resistance? For exploration, we will rely increasingly on biologically-provided life support, as we have throughout our evolutionary history. But once life itself is seen as an enabling technology, we can do so much more. What about the exploration platforms themselves? Metal recovery? Building materials? BioWires? Will this technology work in space? The PowerCell payload on the DLR EuCROPIS mission is designed to do just that. Activated in December 2018, early results will be presented.



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