In the context of global climate change, CO₂ is viewed as a serious liability, something to be “sequestered” from the atmosphere. However, a stream of concentrated CO₂ is a highly valuable resource when photosynthetic microorganisms utilize it to produce renewable substitutes for fossil fuels. This presentation begins by laying out the context for why society needs to exploit photosynthetic microorganisms to replace fossil fuels. It then focuses on two paths for utilizing photosynthetic bacteria to generate massive amounts of renewable fuel feedstock that can replace the energy services we now obtain from fossil fuels. Our team is working on both paths, and I give examples from our work with the sp. PCC 6803. The first pathway is to produce photosynthetic biomass from which we can extract lipids to replace petroleum for transportation fuels and also produce other valuable energy outputs. Key here is recycling the water and nutrients so that the system does not pollute the environment or compete with agriculture. The second pathway is to modify *Synechocystis* so that it produces and excretes the fuel feedstock, which we harvest from the medium. Called the *photosynthetic factory*, the second path minimizes technical and economic roadblocks associated with harvesting products from biomass.

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