Title: Towards a sustainable bio-based economy: Redirecting primary metabolism to new products with plant synthetic biology

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Title Page

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Highlights:

- Plants are the feedstock and primary input into any bio-based economy
- Increasing feedstock value will make bioproducts competitive with petrochemicals
- Basic knowledge of plant metabolism is essential to engineering efforts

Abstract:

Humans have domesticated many plant species as indispensable sources of food, materials, and medicines. The dawning era of synthetic biology represents a means to further refine, redesign, and engineer crops to meet various societal and industrial needs. Current and future endeavors will utilize plants as the foundation of a bio-based economy through the photosynthetic production of carbohydrate feedstocks for the microbial fermentation of biofuels and bioproducts, with the end goal of decreasing our dependence on petrochemicals. As our technological capabilities improve, metabolic engineering efforts may expand the utility of plants beyond sugar feedstocks through the direct production of target compounds, including pharmaceuticals, renewable fuels, and commodity chemicals. However, relatively little work has been done to fully realize the potential in redirecting central carbon metabolism in plants for the engineering of novel bioproducts. Although our ability to rationally engineer and manipulate plant metabolism