

Engineered bioprocess for plastic waste upcycling to chemical feedstocks

Justin Siegel (UC-Davis)

Ramon Gonzalez (University of South Florida)



A convergence of technologies enable us to work with biology in an unprecedented manner.



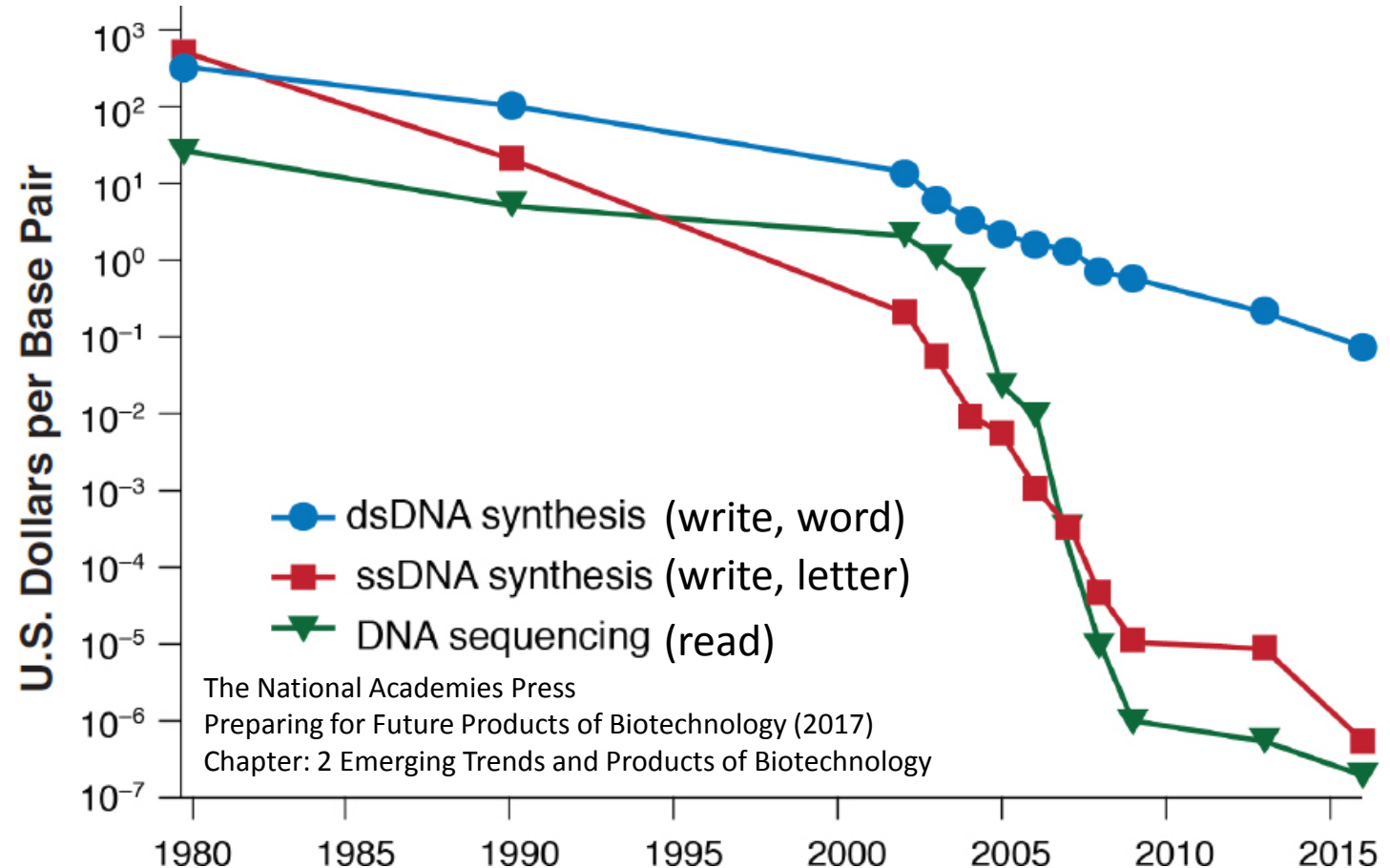
Compute



Genetic

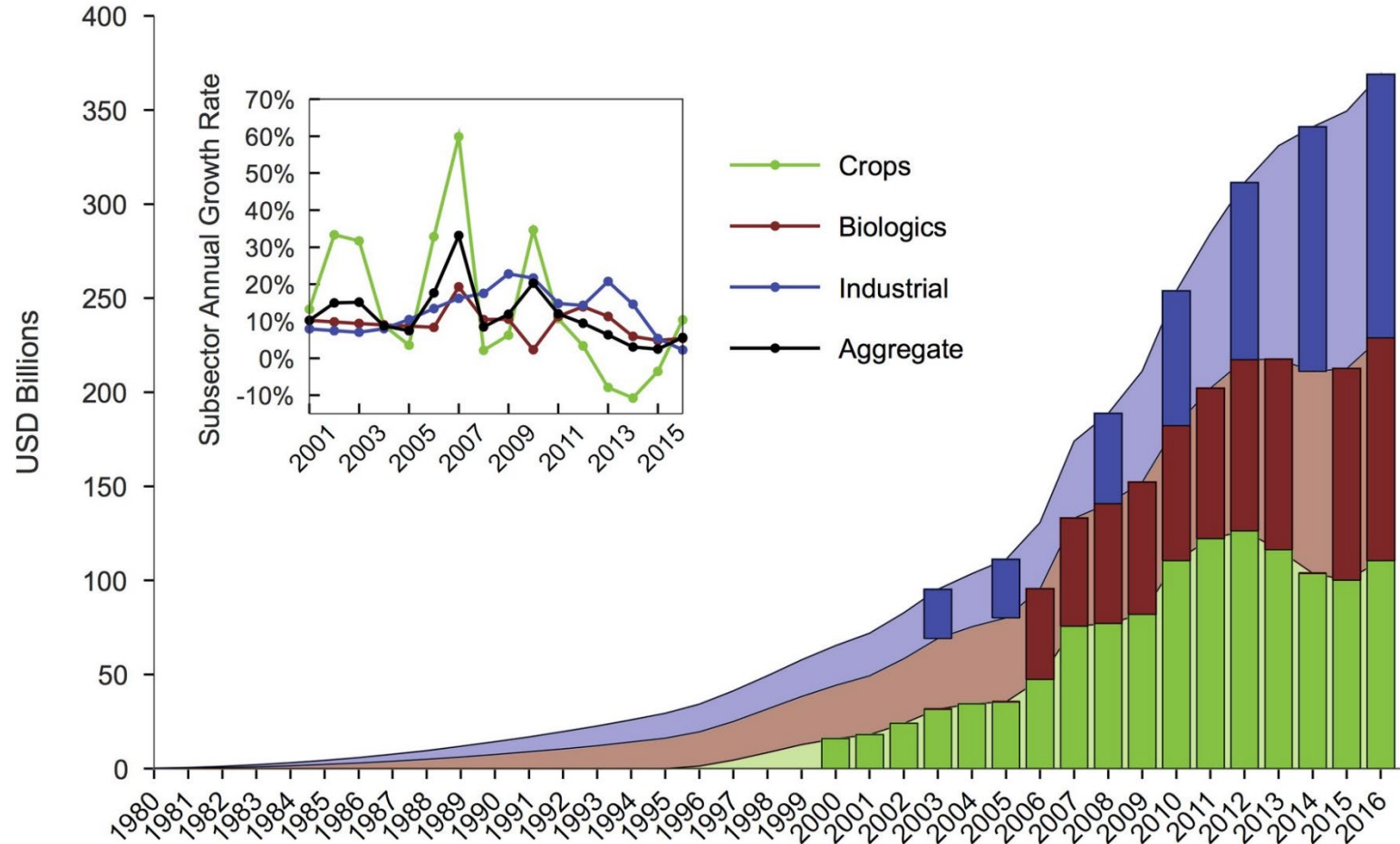


Analytical



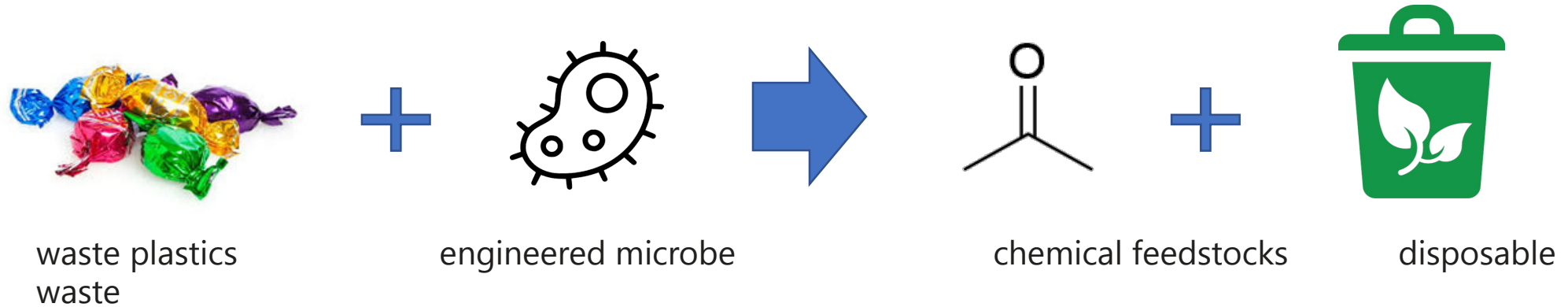
Biotech is a rapidly growing market in industry, ag, & health

Estimated U.S. Biotech Revenues 1980-2016



Source: *Estimating the biotech sector's contribution to the US economy*. Carlson. Nature Biotech. 2016. doi:10.1038/nbt.3491

Opportunity for Bioprocessing to upcycle plastic waste streams



Advantages

- Can utilize mixed feedstocks
 - Impact: Decrease preprocessing requirements
- Mild temperatures and pressures, single unit operation
 - Impact: Low CapEx for distributed, small-scale deployment
- Volatile products
 - Impact: Limited postprocessing and separation

Problems to address

- Need to develop robust enzymes able to efficiently degrade commonly used plastics
- Engineer bacterial strains/consortia that are tolerant to specific reaction conditions (high temperature, biofilm formation)
- Engineer new pathways for non-natural substrate utilization (e.g. monomers)