

# Metabolic Flux Analysis:

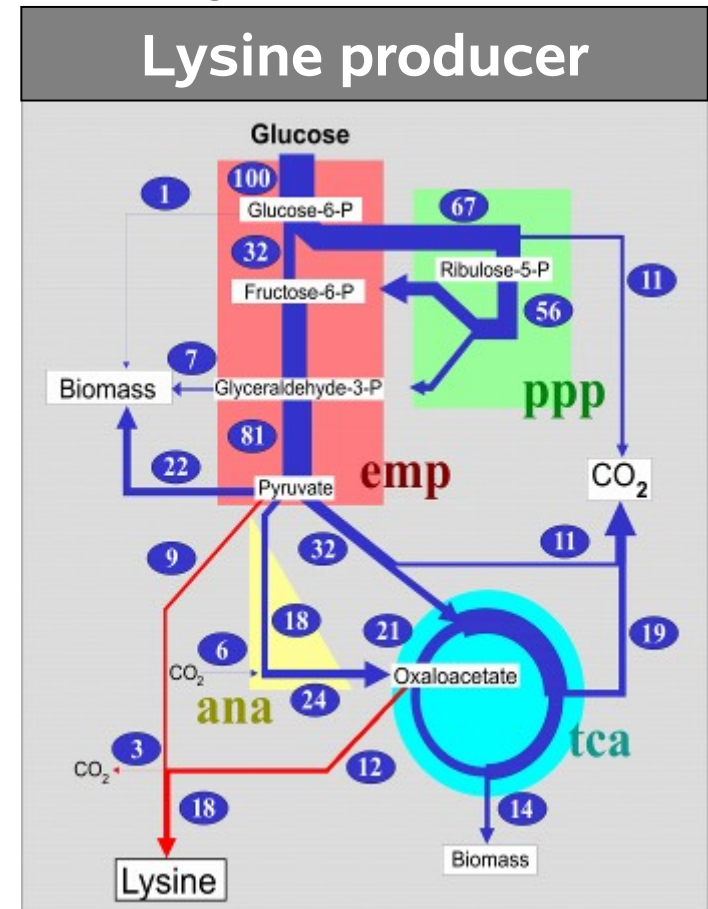
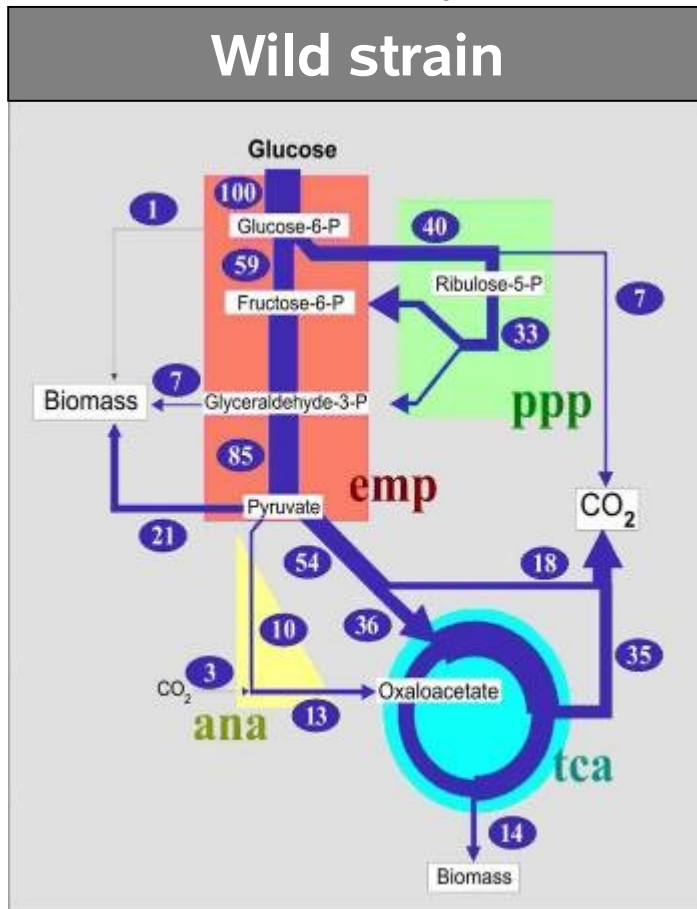
Software Tools for Modeling, Simulation and  
Experimental Design of  $^{13}\text{C}$  Labeling Experiments

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Aachen, 01.03.2007

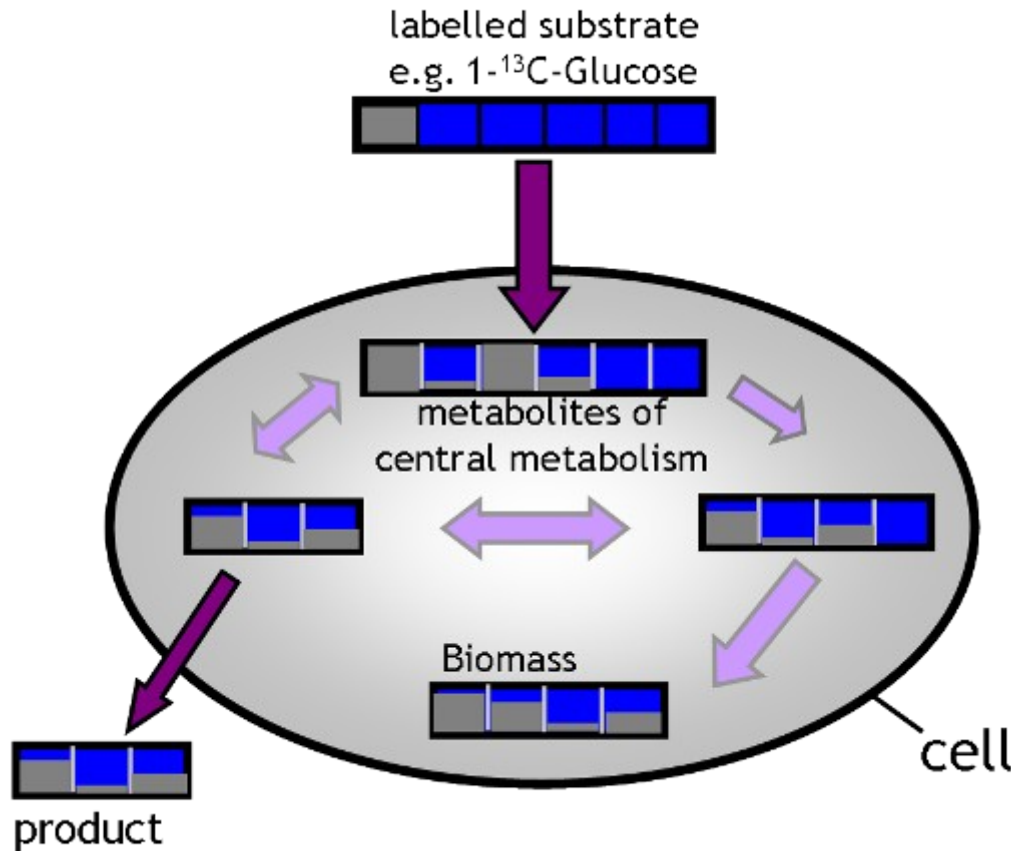


## Flux Analysis Example: *Corynebacterium glutamicum*

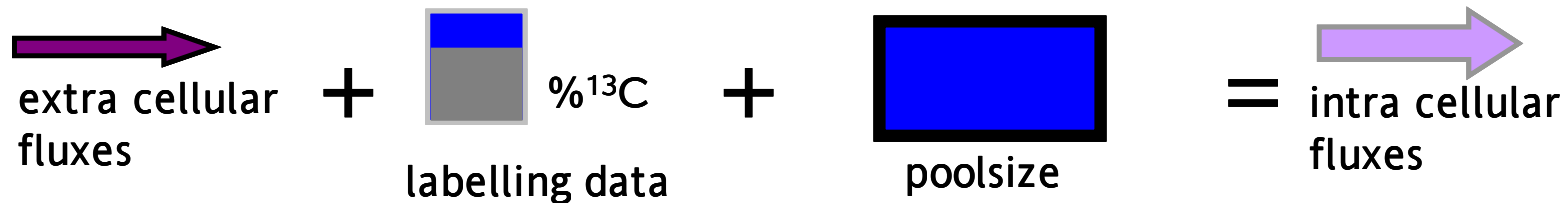


- Screening: strain comparison
- Design: detecting „bottlenecks“
- Diagnostics: genetic manipulations

## The Principle of $^{13}\text{C}$ Metabolic Flux Analysis

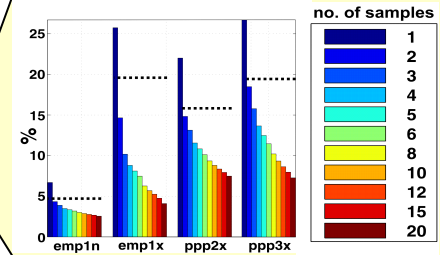


- Incorporation of  $^{13}\text{C}$ -substrate
- Metabolic stationarity assumption
- Analysis of  $^{13}\text{C}$  distribution in intermediate components
- Network stoichiometry & extracellular fluxes

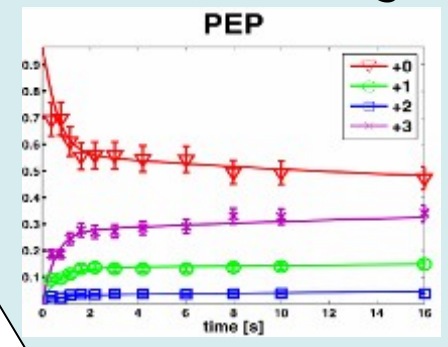




## Statistical analysis

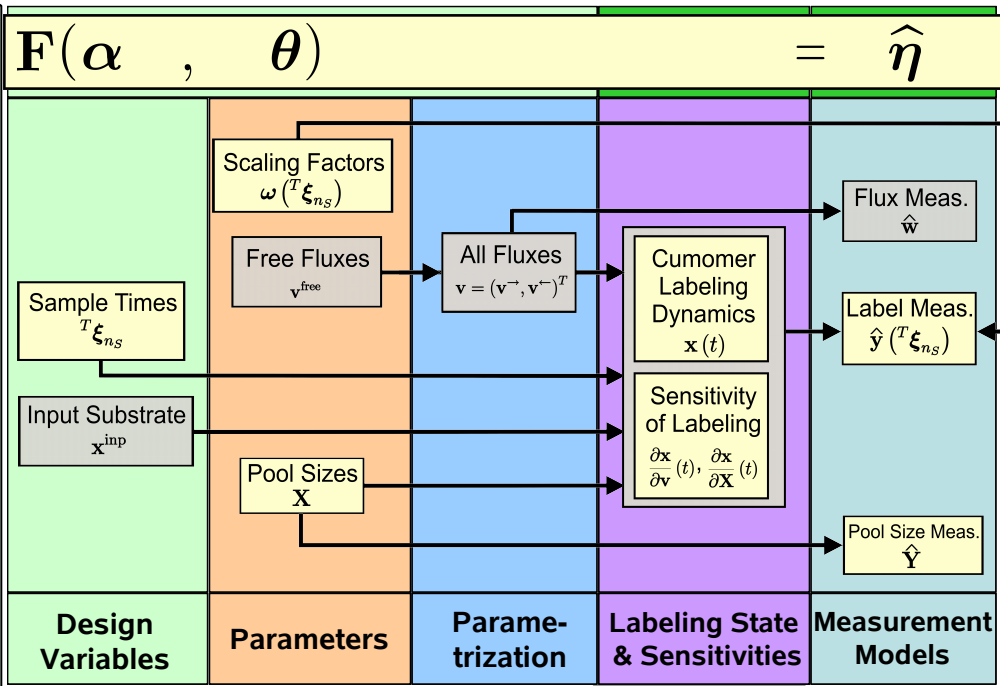


## Parameter fitting



### OED

exponential:  $t_i = a \cdot b^{i-1}$



## Model structure

$$\text{diag}({}^iX) \cdot {}^i\dot{x} = {}^iA(v) \cdot {}^ix + {}^ib(v, x^{inp}, <{}^ix), i = 1(1)m$$

**1000** labeling equations  
**>> 100.000** sensitivity equations