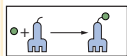


# PROTEIN SYNTHESIS

(A)

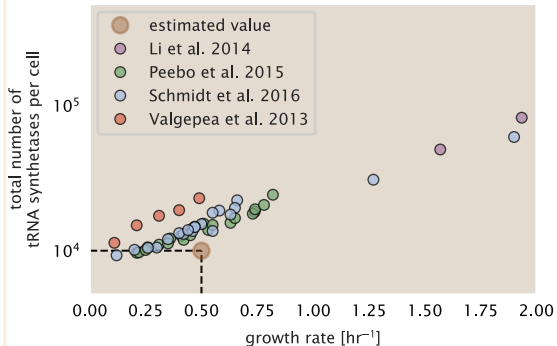
## tRNA charging



$$N_{\text{amino-acyl tRNA}} \approx 3 \times 10^6 \text{ proteins} \times \frac{300 \text{ amino acids}}{1 \text{ protein}} \\ \approx 10^9 \text{ amino-acyl tRNAs}$$

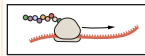
$$r_{\text{tRNA charging}} \approx 20 \text{ amino-acyl tRNA / sec} \quad \text{BNID: 105279}$$

$$N_{\text{tRNA synthetase}} \approx \frac{N_{\text{amino-acyl tRNA}}}{r_{\text{tRNA charging}} \times t_{\text{division}}} \approx 10^4 \text{ tRNA synthetases}$$



(B)

## translation



$$N_{\text{peptide bonds}} \approx 3 \times 10^6 \text{ proteins} \times \frac{300 \text{ amino acids}}{1 \text{ protein}} \\ \approx 10^9 \text{ peptide bonds}$$

$$r_{\text{translation}} \approx 15 \text{ peptide bonds / sec} \quad \text{BNID: 109043}$$

$$N_{\text{ribosomes}} \approx \frac{N_{\text{peptide bonds}}}{r_{\text{translation}} \times t_{\text{division}}} \approx 1.5 \times 10^4 \text{ ribosomes}$$

