How Do Proteins Fold?

A Closer Look at Φ-Values

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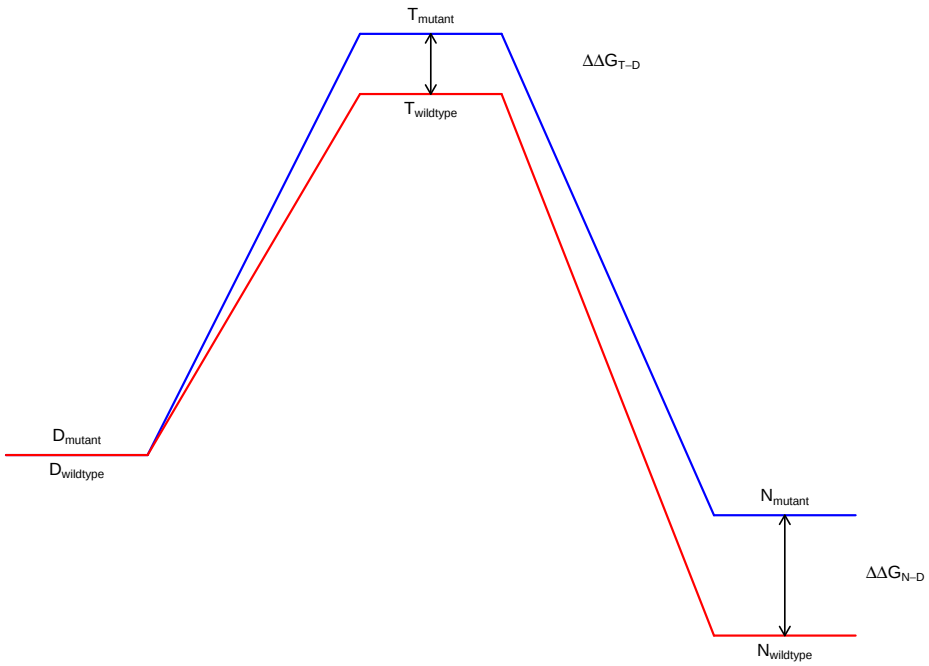
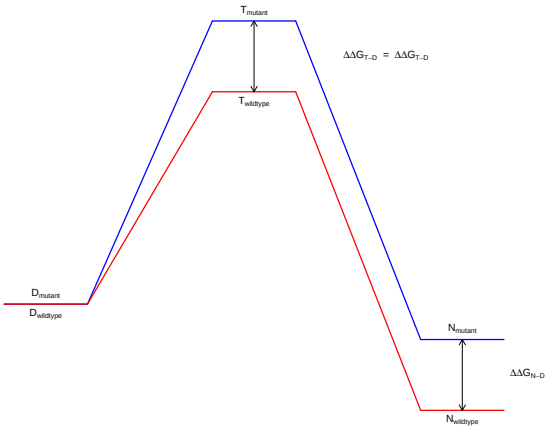
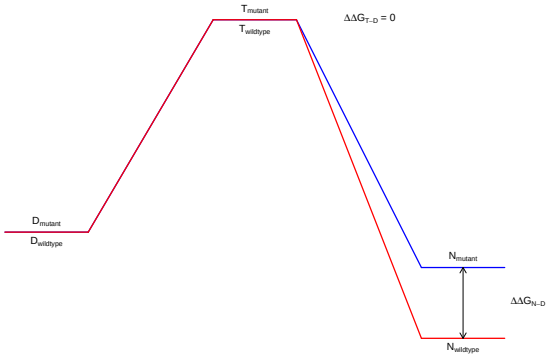
Energy Profile



$\longrightarrow$ The Φ-value is defined as the ratio $\Delta\Delta G_{T\text{-}D}/\Delta\Delta G_{N\text{-}D}$.

Energy Profile



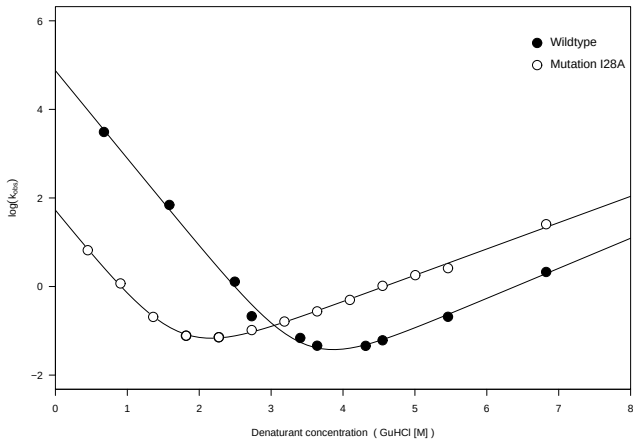


- If the part of the protein that contains the mutant amino acid is fully structured in the transition state, we have $\Delta\Delta G_{T\text{-}D} = \Delta\Delta G_{N\text{-}D}$, and hence $\Phi = 1$.
- If the part of the protein that contains the mutant amino acid is equal in denatured and the transition state, we have $\Delta\Delta G_{T\text{-}D} = 0$, and hence $\Phi = 0$.

Chevron Plots

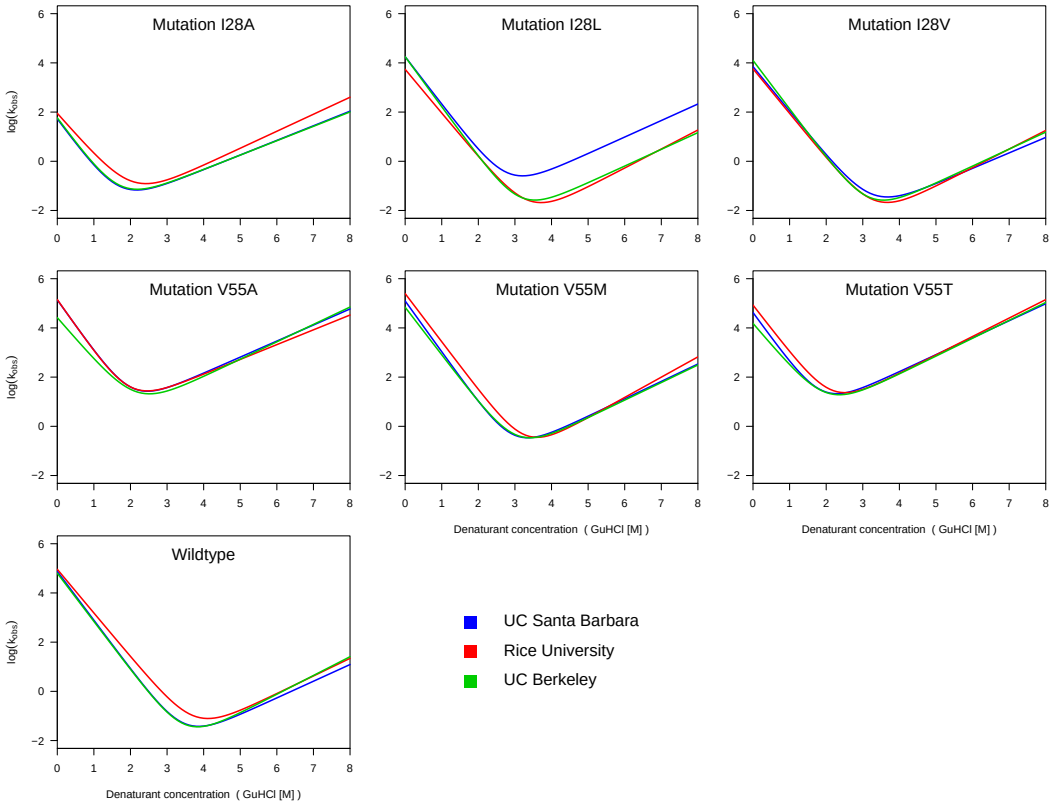
$$\Delta\Delta G_{T\text{-}D} = RT \times \left[\log(k_f^{wildtype}) - \log(k_f^{mutant}) \right]$$

$$\Delta\Delta G_{N\text{-}D} = RT \times \left[\log(k_f^{wildtype}) - \log(k_u^{wildtype}) - \log(k_f^{mutant}) + \log(k_u^{mutant}) \right]$$

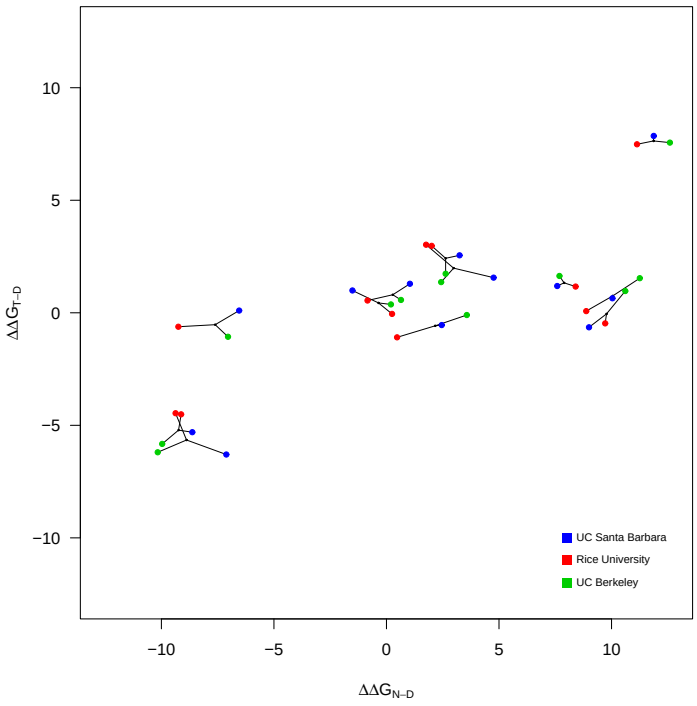


$$\log(k_{obs}) = \log\left(\exp\left[\log(k_f) + m_f \times \frac{C_{GuHCl}}{RT}\right] + \exp\left[\log(k_u) + m_u \times \frac{C_{GuHCl}}{RT}\right] \right)$$

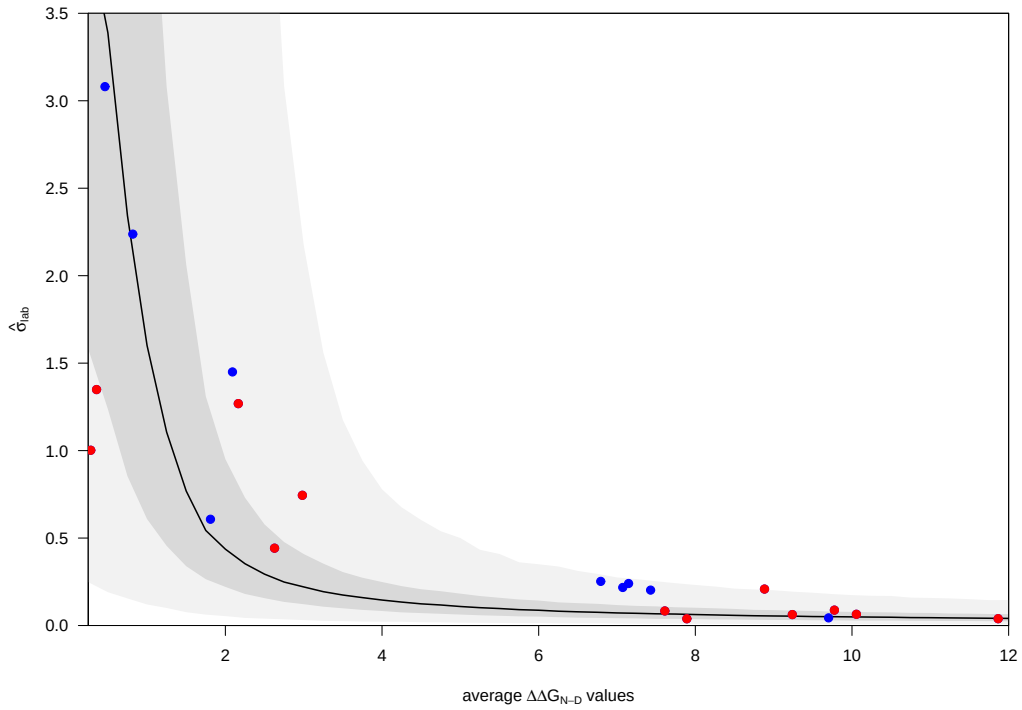
More Chevron Plots



Variability



Some Simulation



Some More Simulations