1 The force exerted by a molecular motor: Fisher and Kolomeisky [1999]

For a scheme where the forward rates are written u_i and the backwards rates are written w_i, this product is useful:

$$\Gamma = \prod_{j=0}^{N-1} \left(\frac{u_j}{w_j} \right) \equiv \exp(\epsilon).$$

Detailed balance imposes the constraint $\Gamma = 1$. I think, but am not sure, this is similar to Onsager.

The diffusion coefficient D can be written in terms of the ratio of rates Γ:

$$D = \frac{1}{2} \left(\Gamma + 1 - 2 (\Gamma - 1)^2 \frac{\omega}{\sigma} \right) \omega d^2,$$

where σ is the sum of all forward and backward rates, $\sigma = u_1 + u_2 + w_1 + w_2$ and $\omega = w_1 w_2 / \sigma$.

The probability of being in state j at site l (j_l) at a particular time t, is given by $P_j(l;t)$.

What mean driving force will a motor exert as it moves along the track?

References

Michael E. Fisher and Anatoly B. Kolomeisky. The force exerted by a molecular motor. *Proceedings of the National Academy of Sciences*, 96(12):6597–6602, 1999. doi: 10.1073/pnas.96.12.6597. URL `http://www.pnas.org/content/96/12/6597.abstract`.