

The Hopfield barrier in gene regulation

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Bacteria do not expend energy to regulate their genes while eukaryotes use several different forms of energy expenditure, such as chromatin reorganisation, nucleosome remodelling, post-translational modification and DNA methylation. What do eukaryotes gain by doing this? I will discuss how being at thermodynamic equilibrium sets a fundamental barrier to genetic information processing and what eukaryotic organisms can achieve by dissipating energy to overcome this barrier.