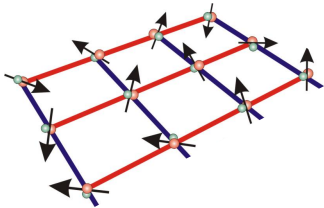


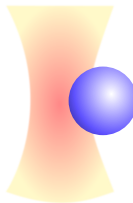
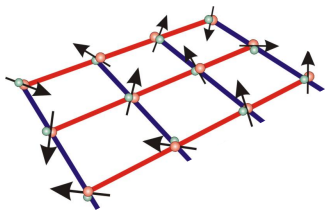
# Shortcuts to adiabaticity



**adiabatic quantum computing:**  
maintaining ground state while  
driving a quantum system

Demirplak, Rice, JPCA (2003)  
Berry, J. Phys. A (2009)

# Shortcuts to adiabaticity



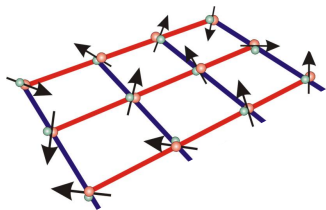
**adiabatic quantum computing:**  
maintaining ground state while  
driving a quantum system

**Brownian motion of  
bead in optical trap:**  
maintaining instantaneous  
equilibrium as trap changes

Demirplak, Rice, JPCA (2003)  
Berry, J. Phys. A (2009)

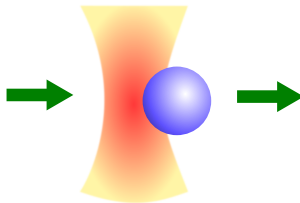
Martinez *et al* Nature Physics (2016)  
Patra, Jarzynski, New. J. Phys. (2017)

# Shortcuts to adiabaticity



**adiabatic quantum computing:**  
maintaining ground state while  
driving a quantum system

Demirplak, Rice, JPCA (2003)  
Berry, J. Phys. A (2009)



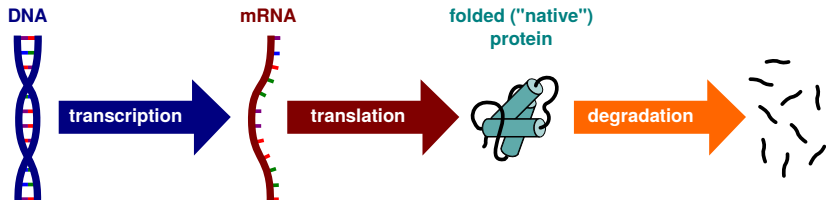
**Brownian motion of  
bead in optical trap:**  
maintaining instantaneous  
equilibrium as trap changes

Martinez *et al* Nature Physics (2016)  
Patra, Jarzynski, New. J. Phys. (2017)

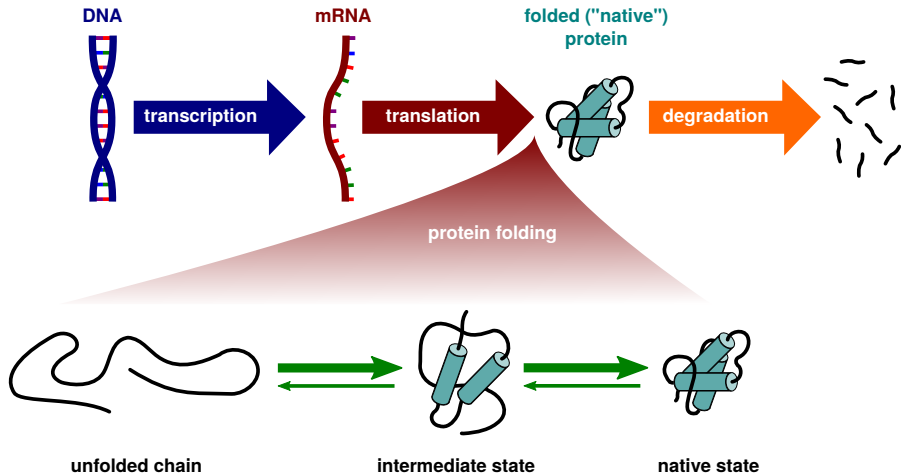


**Possible biological  
applications:**  
population genetics  
molecular chaperones  
force spectroscopy

# Traditional view of protein production

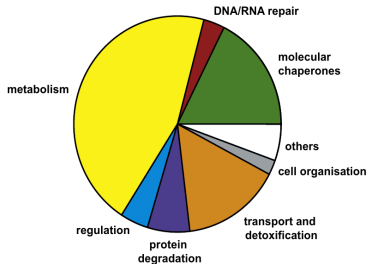


# Traditional view of protein production

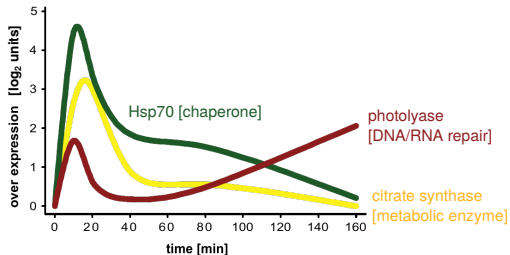


# Example: heat shock response in yeast

Functional classes of upregulated genes in yeast after a heat shock from 25°C to 35°C over 10 min:



[Total: 91 genes upregulated by more than 2.8x]



[Richter *et al.*, Molec. Cell (2010)]