Simulated Annealing

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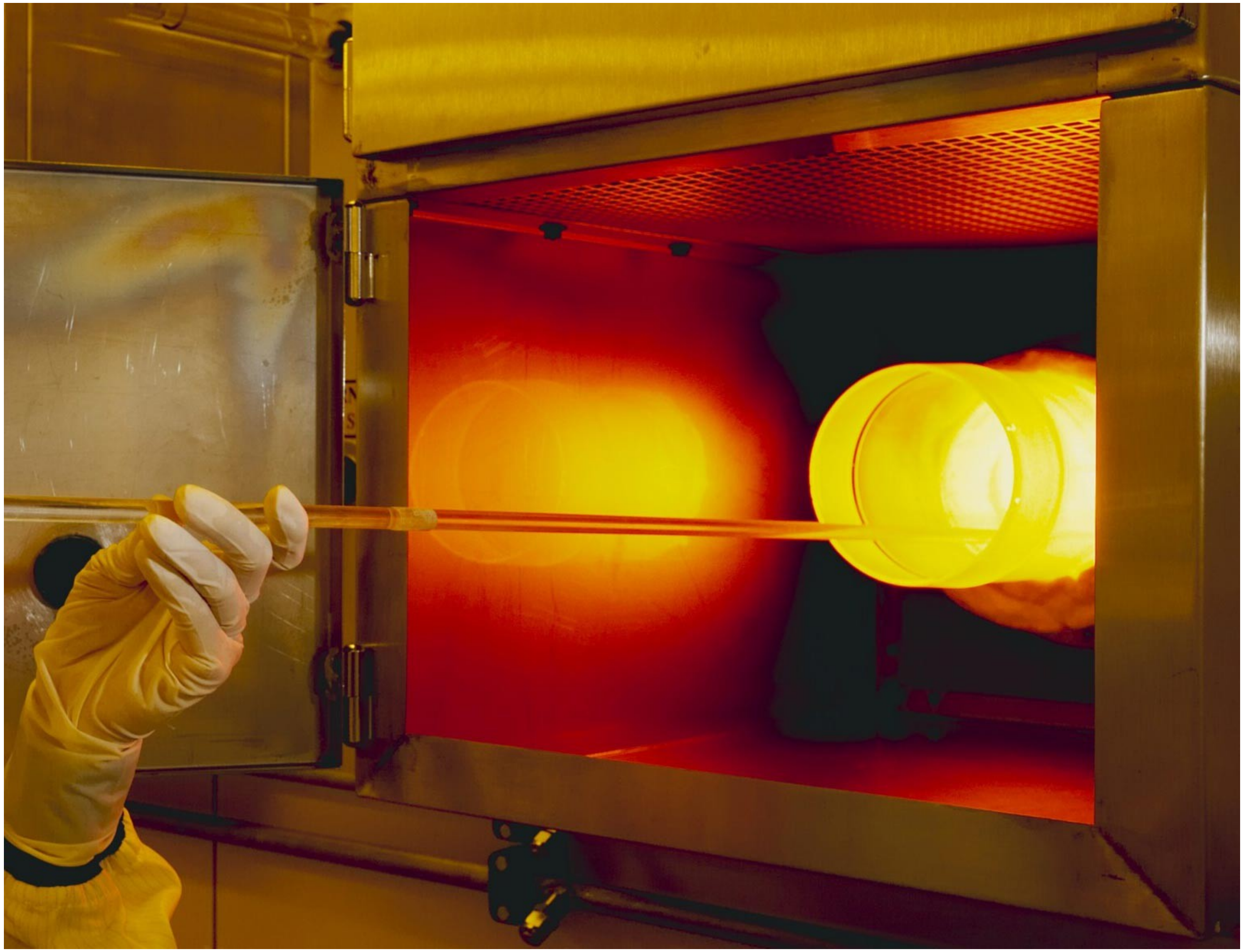
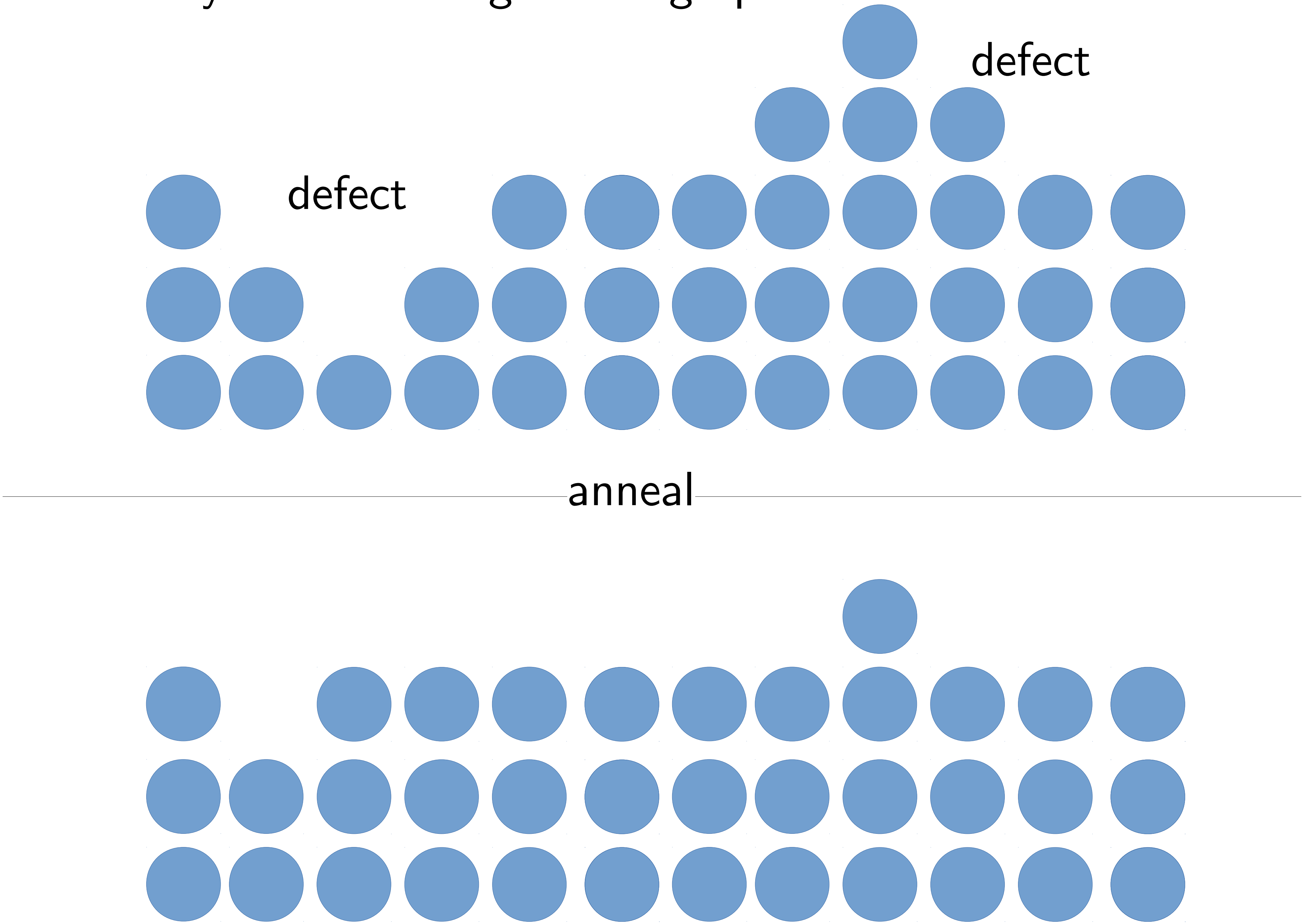
Algorithms, 02/28/2017



Physical annealing: heating up to smooth out defects



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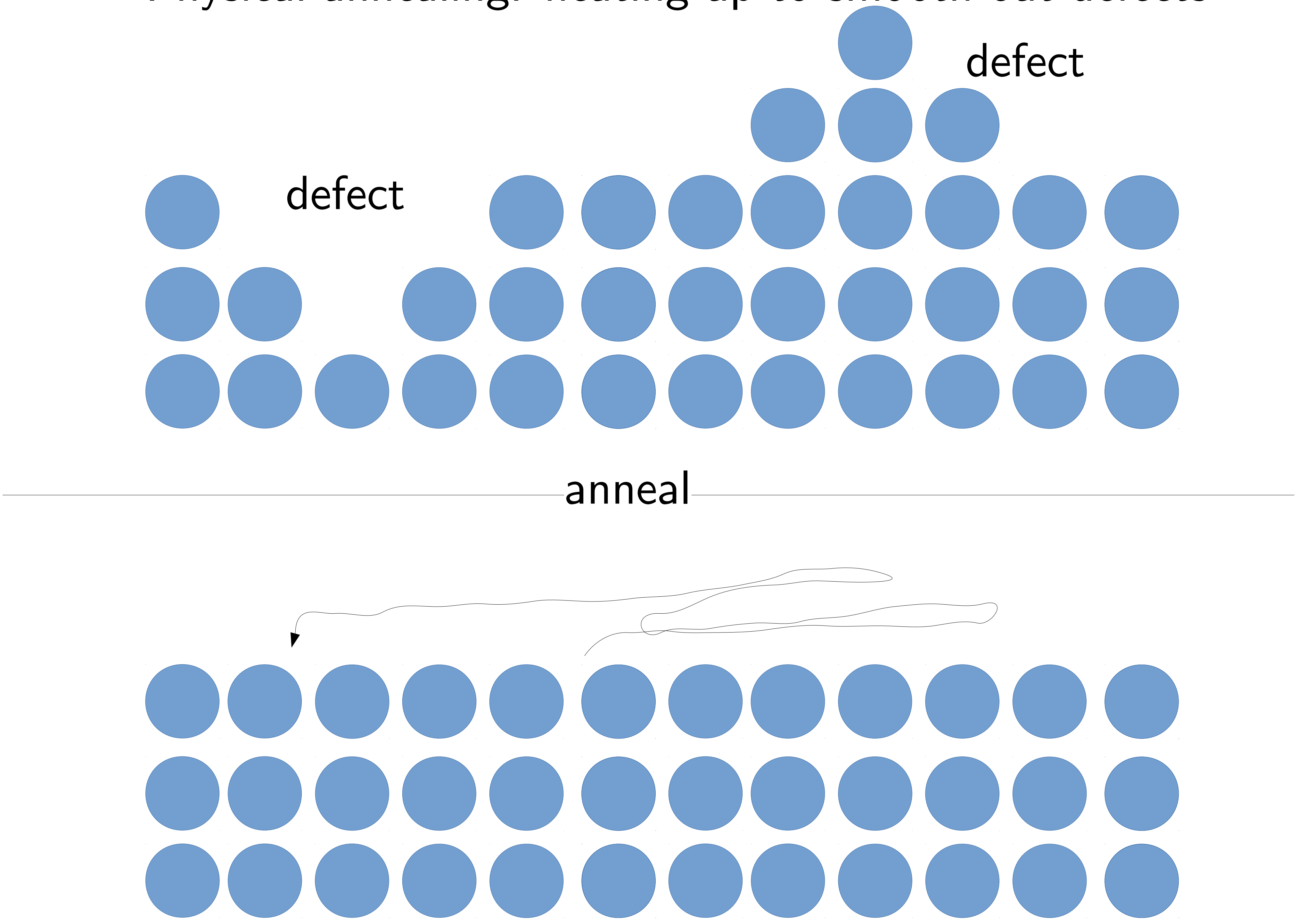

Why it works:
high temperature exploration, low temperature conclusion

Probability of $E \propto e^{-E/k_\mathrm{B}T}$

Physically, atoms want to fill holes,
but have trouble finding them

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First heat it up: allows for atom to pop out of local minima

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Then slowly cool it...

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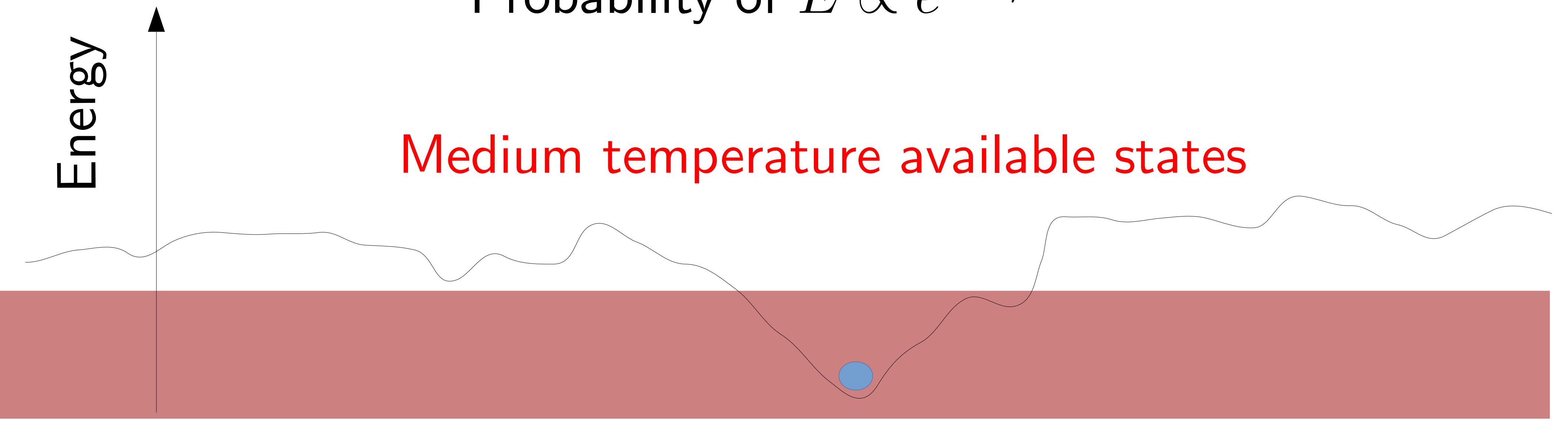

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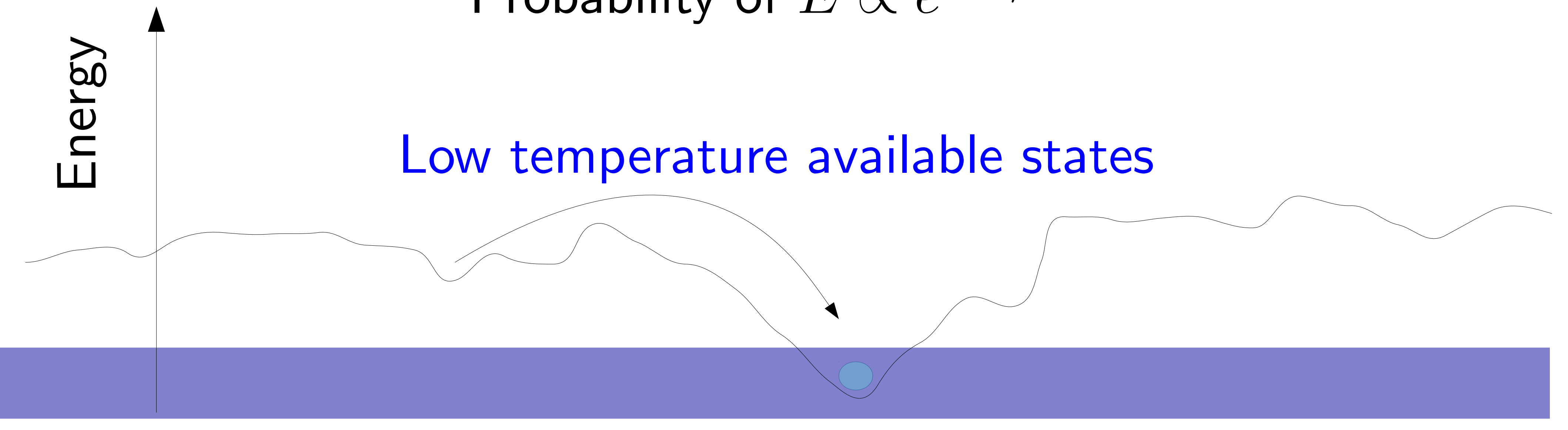


If cooling is slow, equillibrium.

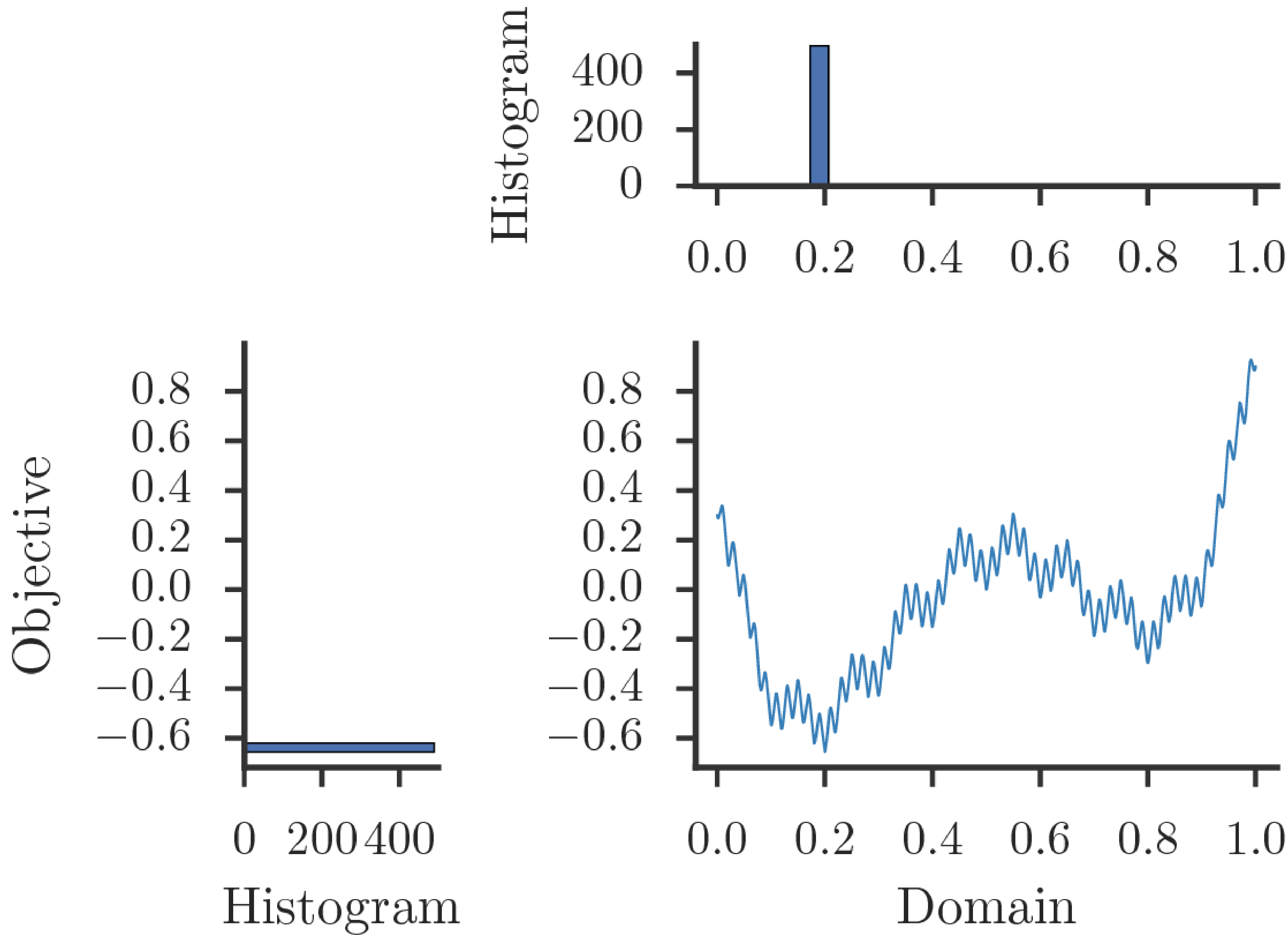
In equillibrium, lowest energy is exponentially more likely.

Metropolis with acceptance $e^{-(E_{\rm new}-E_{\rm old})/k_{\rm B}T}$

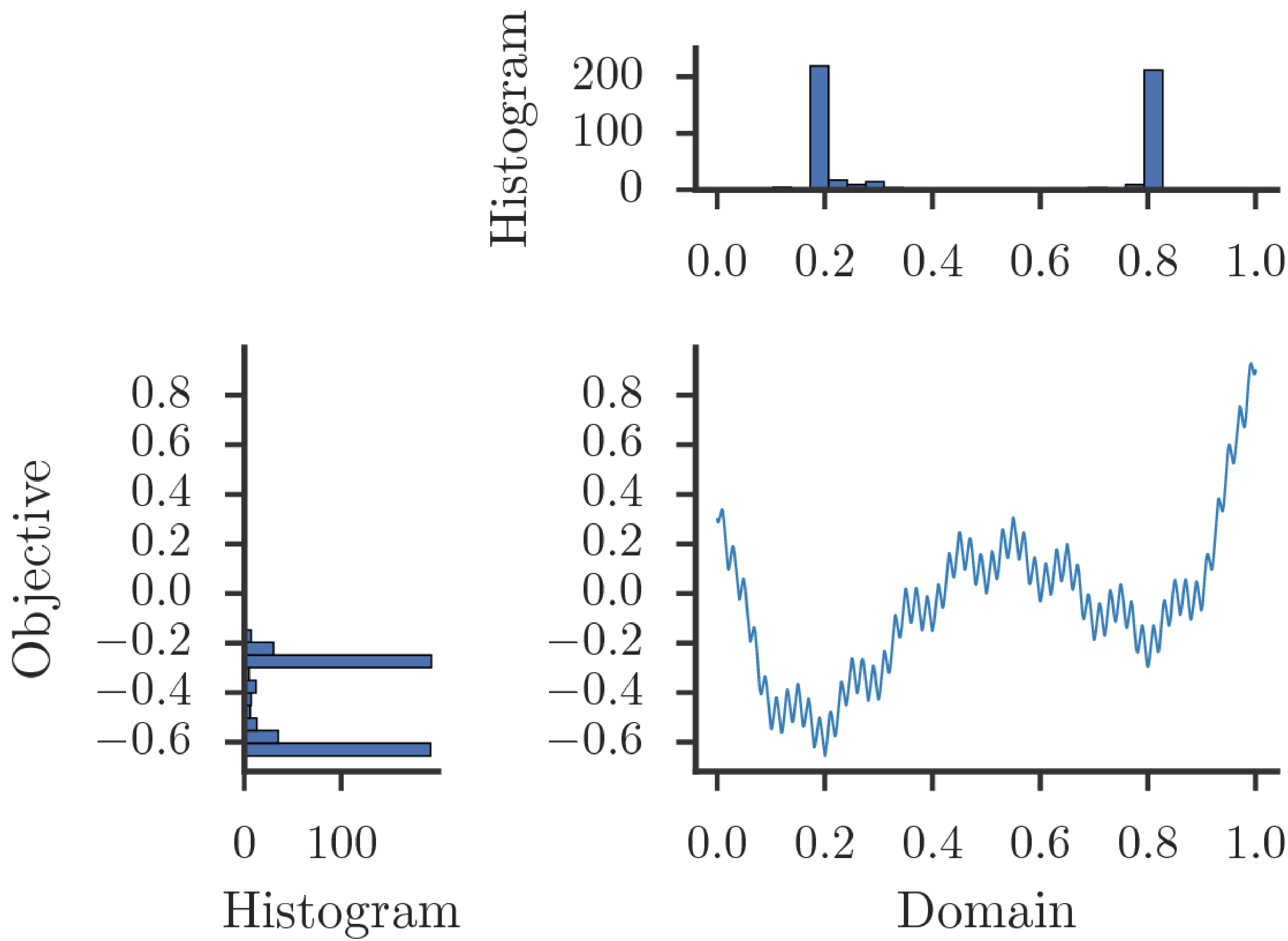
T is an adjustable parameter

(see movie)

For 1000 steps (slow cooling): reliable performance.



For 100 steps (fast cooling): unreliable



Simulated Annealing:

Mimicks the physical process of annealing for approximate optimization

It can handle noisy surfaces

Simple, parallelizable, and should handle high dimensions (We'll see if it does later!)