SO FAR:

Macroscopic properties
P, T, E, W, Q

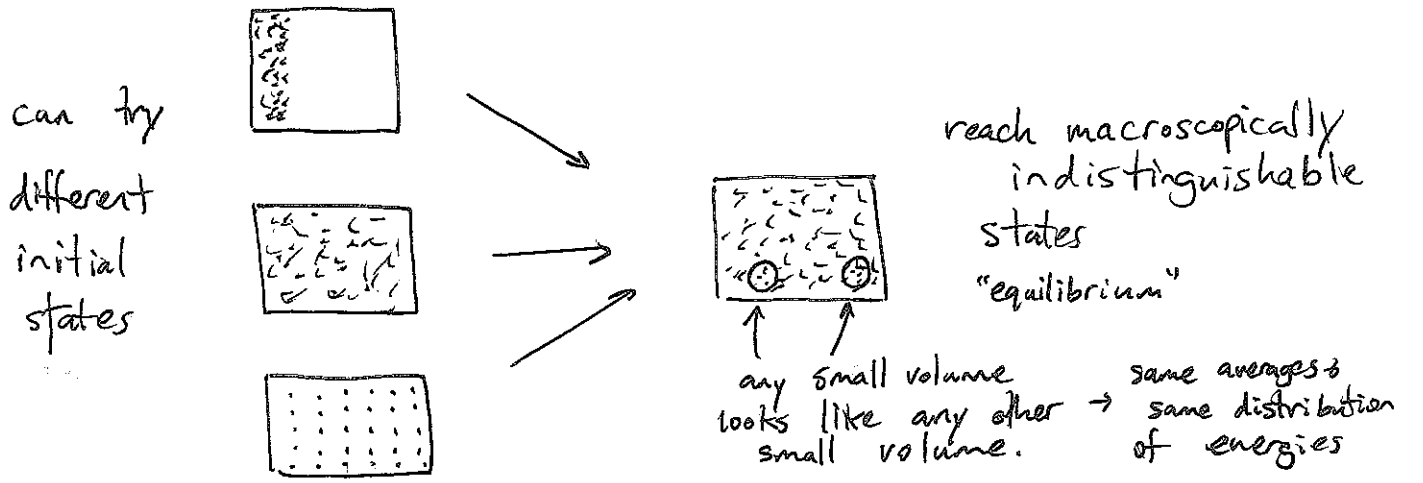
from

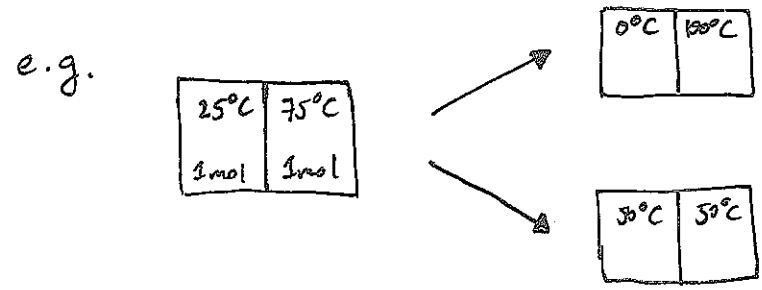
averaged microscopic properties
density / kinetic energy / internal energy of molecules

gave: $PV = nRT$

$\Delta E = W + Q$

Why do any two systems w. same averaged micro properties behave the same?





Both consistent w. conservation of energy, gas law, BUT only 2nd one ever observed to happen.
WHY?

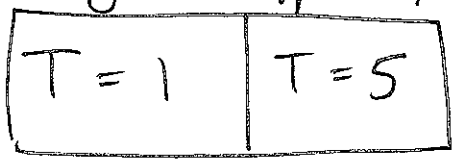
POPCORN DEMO

People : molecules

Popcorn: energy

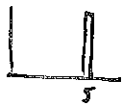
Temperature: avg # of popcorn per person.

START :

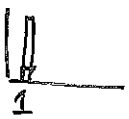


distribution

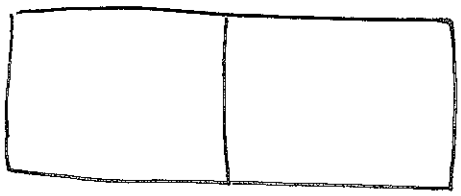
LS:



RS



END :



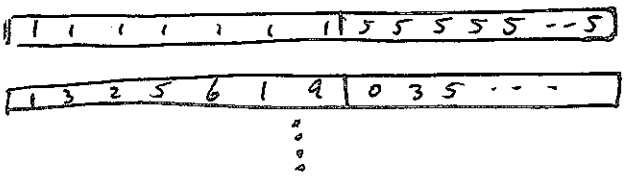
LS

RS

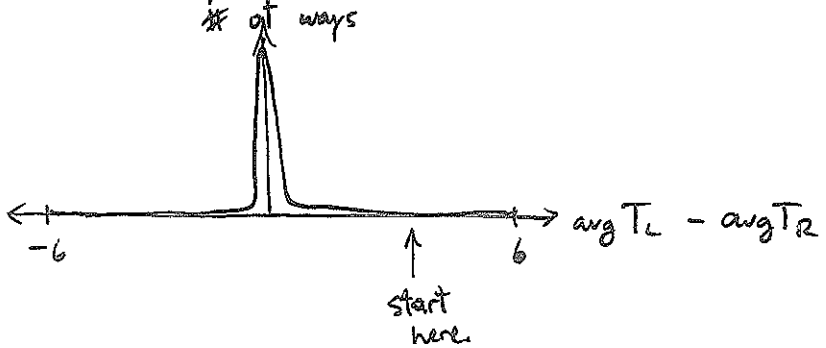
Repeat with 10^{23} Science One students: after sufficiently long time, avg is almost exactly T=3 on both sides, same distribution.

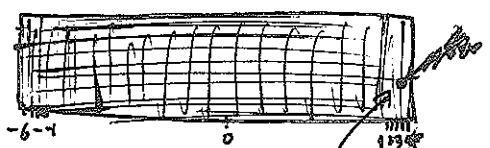
Different rule for trading: same results.

Explanation: consider all possible ways to distribute 3N kernels.



- very few have significantly different average





start here, move around randomly: likely to end up w. $|T_L - T_R| < 1$

Interactions: allow us to move around on set of possible configurations.

After a while, configuration is random.

Almost all configurations have the same macroscopic properties.