Mini-lecture Entropy

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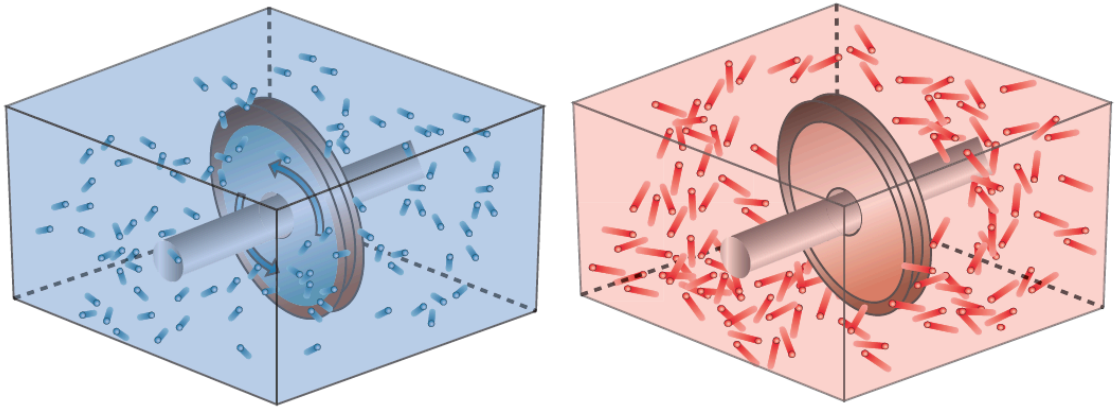
Microscopic view of entropy



(a) State 1: spinning flywheel, cool. (b) State 2: flywheel at rest, warm.

Microscopic randomness: entropy to quantify it.

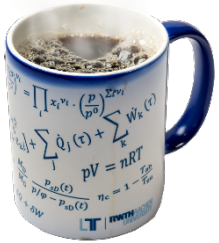
- State 1: low entropy (organized rotation of the flywheel)
- State 2: high entropy (random motion of warm gas)

$$S_2 > S_1$$

The Asymmetry of Conversion Processes

1. Law = Conservation of Energy

Everyday observation:
Processes have a natural direction in which they proceed spontaneously



Thermal processes

Mechanical processes

⇒ **Wanted: State property XXX** that decides about the **directions** of change
- Real (= **Irreversible**) processes: **„XXX increases“**
- Ideal (= **Reversible**) processes: „XXX stays constant“

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Ezelsbruggetje: Entropy

Entropy S:

$$\mathrm{d}S^{\mathrm{Q}} = \frac{\delta Q_{\mathrm{i}}}{T_{\mathrm{i}}} = \frac{\mathrm{Kuh}}{\mathrm{Tee}} = \frac{\mathrm{koe}}{\mathrm{thee}}$$

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$$\underbrace{dS^{Q}}_{\text{„Increase disorder“}} = \underbrace{\frac{\delta Q_i}{T_i}}_{\sim \text{ amount of heat} \;\; \sim \text{ 1 / temperature}}$$

Vielen Dank
für Ihre Aufmerksamkeit

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