

# Entropy in the Quantum World

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# Outline

- **Entropy in the classic world**
- **Theoretical background**
  - Density matrix
  - Properties of the density matrix
  - The reduced density matrix
- **Shannon's entropy**
- **Entropy in the quantum world**
  - Definition and basic properties
  - Some useful theorems
- **Applications**
  - Entropy as a measure of entanglement
- **References**

# Entropy in the classic world

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- **Murphy's Laws**

If something can go wrong, it will!

The more we complicate the plan,  
the greater the chance of failure.

Nothing is ever so bad, that it can't get worse.