

Entropy

Physics

The statistical and thermodynamic definitions, and how they connect.

Entropy is proportional to the logarithm of the number of accessible microstates.

$$S = k \ln W \cdot \Delta S = Q/T \text{ for a reversible change}$$

Gas expanding into a vacuum More positions available, S increases

Ice melting More arrangements, S increases

A tidy room Far fewer arrangements than an untidy one

The everyday analogy.

THE COMMON MISTAKE

✗ **Reading entropy as disorder**

✓ **It counts accessible microstates**

Disorder is a loose analogy that fails in several cases. Counting microstates is the actual definition.

Entropy increases because high-entropy states are overwhelmingly more numerous, not because of any force pushing toward them.