

## Curiosity Thread: A Direction Is Not a Stopwatch

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Picture a marble resting on one side of a landscape. The lower valley can be the favored destination, but a ridge may still stand between the marble and the valley. Thermodynamics asks about the difference between the starting and ending situations; kinetics asks about the route and its barrier. Those are different questions.

Entropy adds another layer. A gas in a larger volume has more accessible arrangements than the same gas in a smaller volume. This is more precise than simply calling the first arrangement “messier.” It also makes the system boundary visible: a claim about the gas is not automatically a claim about the gas plus everything around it.

At a stated temperature and pressure, the classroom expression  $\Delta G = \Delta H - T\Delta S$  combines the enthalpy and entropy contributions. Temperature changes the size of the entropy term, so there is no rule that higher temperature always favors the same direction. A negative result is a limited direction prediction, not a stopwatch and not a guarantee that every particle ends up in products.