

Do Thermodynamic Entropy and Quantum Non-locality Have a Common Basis?

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Abstract. Both researchers and educators have expressed displeasure with the definition of entropy as a measure of disorder. Instead, it is argued by Leff, Lambert, and others that the increase of entropy can be far more accurately described using terms such as ‘dispersal of energy,’ ‘spreading and sharing of energy,’ and ‘spatial and temporal spreading.’ In decoherence theory, a similar metaphor is used to describe the phenomena involved with quantum non-locality, superposition, and entanglement. Specifically the wavefunction of a quantum entity, such as a sub-atomic particle or photon is not seen to collapse but rather is transferred through interactions to a system and/or its environment. This suggests there may be a common basis for entropy and non-locality. I explore the idea that energy is motive by nature, and that all its forms of expression involve motion, action, and propagation, which clearly leads to its being spread and shared when unconstrained, among the available microstates of its local system and the larger environment. Thus a single description, focusing on this universal quality of energy, explains both 2nd Law entropy and quantum non-locality.

Keywords: Entropy, Thermodynamics, Non-locality, Entanglement, Decoherence

PACS: 65.40.gd, 05.70.Ln, 03.65.Ud, 03.65.Yz

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