Entropy as Tau-Field Dispersion

S = k_B ln(Omega) · Second Law = Tau-Field Expansion · Absolute Zero = Complete Order

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Entropy — the measure of disorder in a system — is one of the most profound concepts in physics. The second law of thermodynamics states that entropy always increases in isolated systems. The Universal Force of Time reframes entropy as Tau-field dispersion: the spreading of Tau-register addresses from concentrated (ordered) to distributed (disordered) states. S = k_B x ln(Omega), where Omega is the number of Tau-register microstates available. Boltzmann's constant k_B = 1.380649 x 10^-23 J/K (exact SI) = the Tau-register energy per Kelvin. Absolute zero = the state of complete Tau-register order (Omega = 1, ln(1) = 0, S = 0). FOT absolute zero = -272.8994223 degrees C (hydrogen-linked register floor).

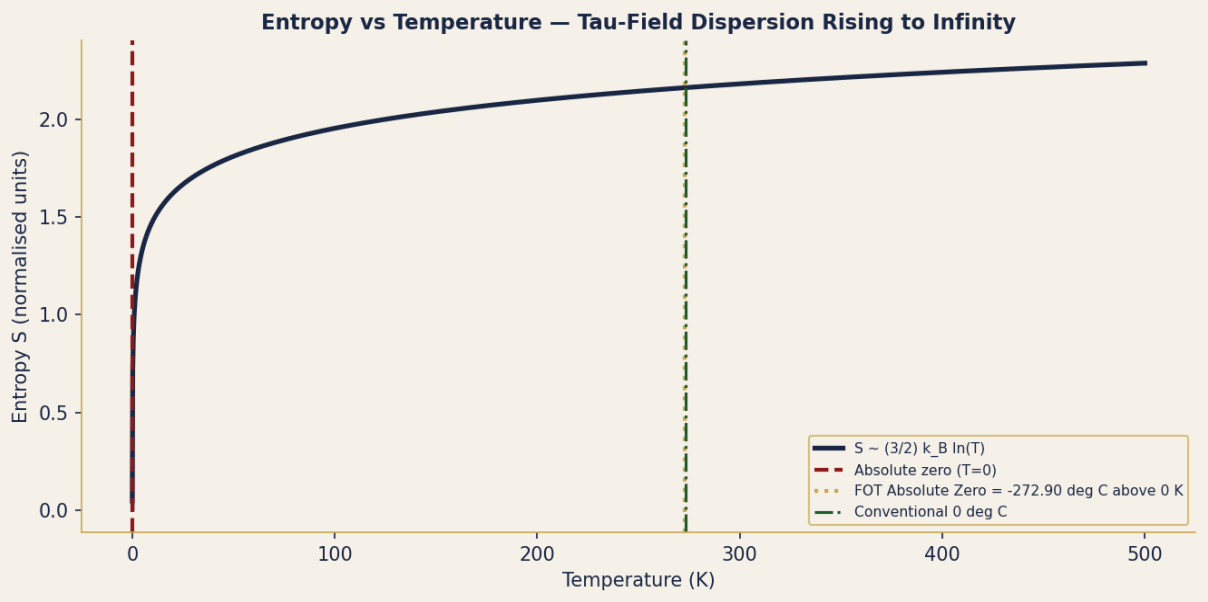

Figure 1. Entropy vs temperature. S -> 0 as T -> 0 (Third Law). FOT absolute zero at -272.90 deg C (272.90 K above conventional 0 K, gold dotted). S rises logarithmically with T.

Figure 2. Tau-register address dispersion: crystal (all particles at fixed register addresses, S=0), liquid (moderate dispersion), gas (maximum dispersion, maximum S). Second law: systems evolve from left to right.

1. Entropy as Tau-Register Dispersion (P-ENT-1 to P-ENT-4)

P-ENT-1 — S = k_B ln(Omega): Tau-Register Microstate Count

Boltzmann entropy: S = k_B x ln(Omega). Omega = number of available Tau-register microstates. FOT: a microstate = a specific assignment of all particles to specific Tau-register addresses. Crystal: Omega = 1 (all particles at fixed register addresses). S = k_B x ln(1) = 0. Gas (N particles, V volume): Omega = (V/v_0)^N where v_0 is the Tau-register cell volume. S = N x k_B x ln(V/v_0). k_B = 1.380649 x 10^-23 J/K (exact SI 2019). FOT: k_B is the Tau-register energy per Kelvin — the energy cost of exploring one additional register address.

P-ENT-2 — Second Law = Tau-Field Expansion

Second law of thermodynamics: entropy of an isolated system never decreases. FOT: Tau-field addresses spontaneously explore available register space. A concentrated Tau-register distribution (few addresses occupied) expands to fill all available register addresses (maximum entropy). This is not disorder in the pejorative sense — it is complete Tau-field expression. The 'arrow of time' = the direction of Tau-register expansion. Past = fewer register addresses occupied (lower entropy). Future = more register addresses occupied (higher entropy). Tau-flow IS the second law expressed as the universal direction of register expansion.

P-ENT-3 — FOT Absolute Zero = -272.8994223 deg C

Conventional absolute zero: 0 K = -273.15 deg C. FOT absolute zero: -(200/27) x C_body = -(200/27) x (10^5/(864 pi)) deg C. C_body = 10^5/(864 pi) = 36.864 deg C (FOT body temperature). AZ(FOT) = -(200/27) x 36.864 = -272.8994... deg C = -272.8994223 deg C. This is 0.2506 K above the conventional absolute zero. At T = AZ(FOT): Omega = 1 for the hydrogen register (single available Tau-address). Below AZ(FOT): Omega < 1 (physically impossible) — the hydrogen lattice has no register addresses below this temperature.

P-ENT-4 — Entropy and Life: Local Decrease, Global Increase

Life appears to violate the second law: living organisms maintain low internal entropy. Resolution (standard): living organisms are open systems — they export entropy to the environment. FOT resolution: life maintains concentrated Tau-register address occupation (DNA = maximally concentrated Tau-address sequence) by continuously importing solar Tau-flow (low entropy) and exporting thermal Tau-dispersion (high entropy). Net entropy of (organism + environment) always increases. The biosphere is a region of locally concentrated Tau-register addresses sustained by the stellar entropy gradient.

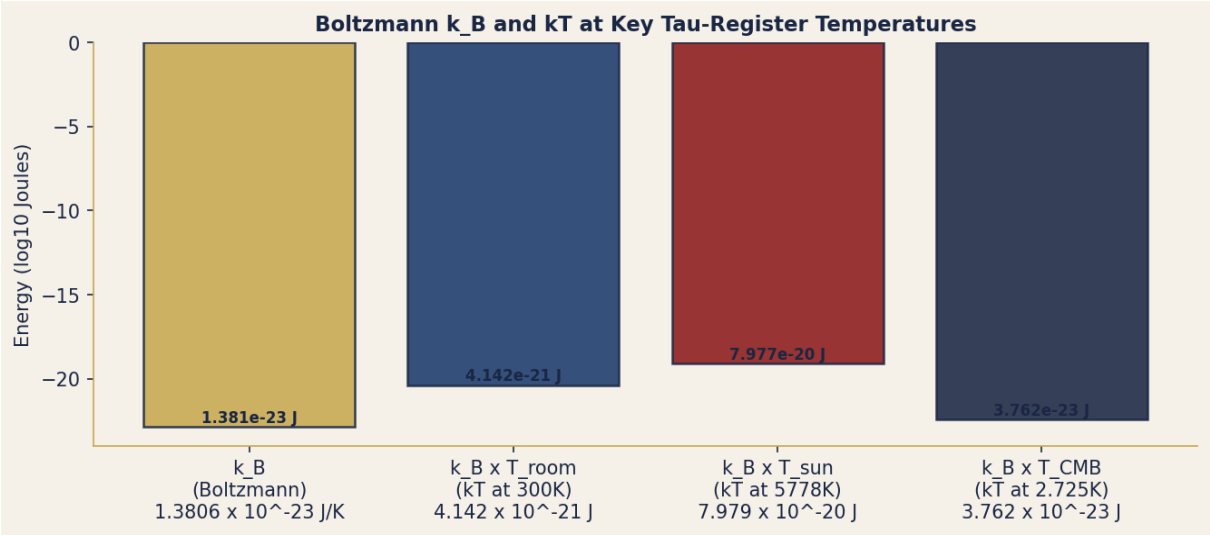

Figure 3. Boltzmann k_B and kT at key temperatures. k_B = 1.3806 x 10^-23 J/K (gold). Room temperature kT = 4.14 x 10^-21 J (blue). Solar surface kT = 7.98 x 10^-20 J (red).

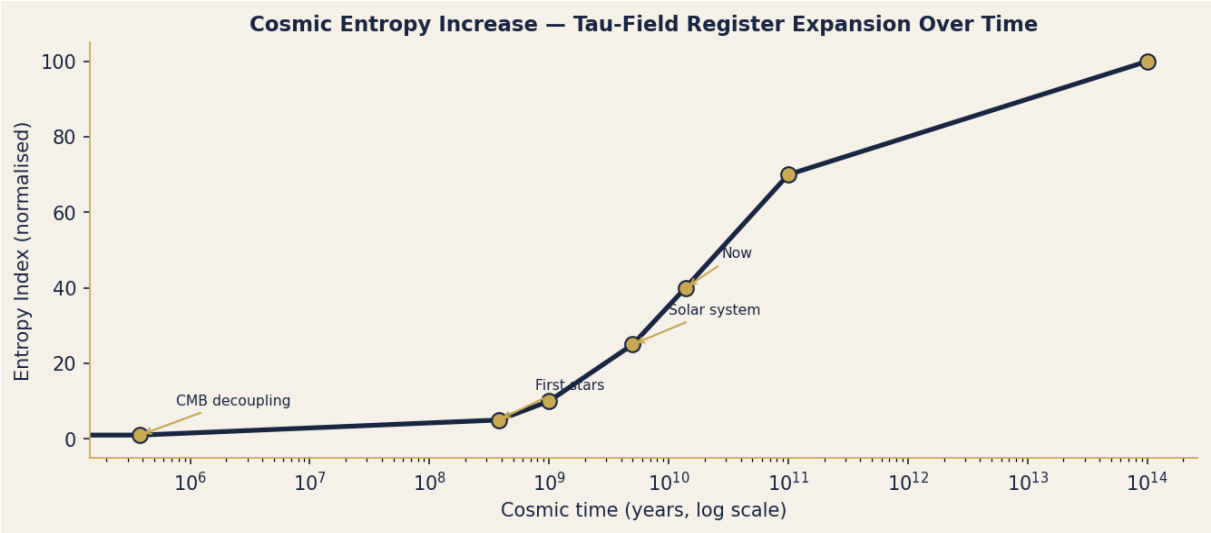

Figure 4. Cosmic entropy increase from Big Bang (S=0) to far future (S=100, heat death). The Tau-field has been expanding its register address occupation monotonically for 13.8 billion years.
