Thermodynamics as the Unifying Substrate:

A Surplus-Driven Field Framework for Motion, Collapse, and Internal Recursion

Version 2: Funneled-Spring Recursion Added
Updated: Cohesion UFT Causal Order Inserted

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Abstract

Thermodynamics establishes the foundational substrate for the Cohesion UFT. The three Cohesion UFT operators — Surplus, Collapse, and Continuance — map directly onto the thermodynamic master equation $dU = T\,dS - p\,dV + A\,d\xi$. Version 2 shows that the Continuance equation under sustained positive affinity generates the funneled-spring geometry whose torsion dynamics connect the pressure axiom to the golden angle and the fine-structure constant. This update inserts the Cohesion UFT causal order of the funneled-spring recursion where the slip event is described. No operator definitions are altered.

1. The Cohesion UFT Operators and the Thermodynamic Master Equation

The thermodynamic master equation is:

$$dU = T\,dS - p\,dV + A\,d\xi. \tag{1}$$

The Cohesion UFT operators map directly onto its terms: Surplus $\leftrightarrow dU$ (internal energy change), Collapse $\leftrightarrow -p\,dV$ (pressure-driven contraction), Continuance $\leftrightarrow A\,d\xi$ (affinity-driven reorganisation). This mapping is structural, not metaphorical. No operator definitions are altered by this update.

2. From the Continuance Equation to the Funneled Spring

When affinity $A(\Sigma, p, T, \xi) > 0$ is sustained, the Continuance equation drives ξ continuously toward deeper recursive structure. The minimum closed form available to a system driven to deepen its internal structure while maintaining identity is rotation. Rotation under sustained surplus produces a logarithmic spiral:

$$r(\theta) = r_0\, e^{k\theta}, \qquad k = \frac{g}{\omega}. \tag{2}$$

The logarithmic spiral is the 2D planar projection of the funneled spring: the 3D geometry generated by the Continuance equation under sustained positive affinity. The funneled spring is not a metaphor. It is the actual geometry of the recursion. Torsion accumulates in this spring under each recursion turn. When torsion reaches the coherence limit $\tau_{\max} = S_{\text{intr}}$, the spring slips — a discrete angular release $\Delta\theta_{\text{slip}} = \hbar/S_{\text{intr}}$.

The slip event is the transition point between one coherence interval and the next. The causal order governing this transition is:

Cohesion UFT Causal Order:

Tension → Surplus → Torsion → Slip → Acceleration → Maintained Motion

Slip is the cause of acceleration, not the result of it. Slip is a temporary release of torsion; because the field remains under pressure, the release initiates the restart of the recursion into the next coherence interval. Acceleration here refers strictly to that restart. It does not refer to macroscopic motion, classical forces, or cross-scale dynamics.

The optimal packing condition on the funneled-spring spiral yields the golden angle:

$$\theta_\varphi = \frac{360^\circ}{\varphi^2} \approx 137.508^\circ \tag{3}$$

as the thermodynamic attractor — the angle that maximises structural efficiency of thermodynamic recursion in the continuous limit. The fine-structure constant $1/\alpha = 137.036^\circ$ is the finite-time attractor: where the recursion lands when torsion accumulates for exactly one coherence interval before slip. The gap is the slip operator — an identity [2].

3. The Three Cohesion UFT Field Equations

$$\frac{\partial \Sigma}{\partial t} + \nabla \cdot (\Sigma\, v) = A\dot{\xi}, \tag{4}$$

$$\Sigma\big(\partial_t v + (v \cdot \nabla)v\big) = -\nabla p + \nabla(A\xi), \tag{5}$$

$$\frac{\partial \xi}{\partial t} + (v \cdot \nabla)\xi = L \cdot A(\Sigma,\, p,\, T,\, \xi). \tag{6}$$

These three equations constitute the Cohesion UFT's unified field system. All Cohesion UFT behaviour — equilibrium, collapse, recursion, spiral formation, and torsional slip — emerges from them. The thermodynamic substrate established in this paper is what makes the funneled-spring derivation possible.

4. Conclusion

Thermodynamics supplies the substrate. The Cohesion UFT supplies the operators. The funneled spring is the geometry they generate. The golden angle is the attractor. The fine-structure constant is the finite-time expression of that attractor. The Cohesion UFT causal order — Tension → Surplus → Torsion → Slip → Acceleration → Maintained Motion — is the sequence by which each recursion cycle completes and the next begins. Acceleration refers strictly to the restart of the recursion into the next coherence interval.

References

[1] Gilbert, D.A., Cohesion UFT series, Independent Researcher (2025–2026).

[2] Gilbert, D.A., *The Fine-Structure Constant and the Golden Angle*, v5, Independent Researcher (2026).

[3] Callen, H.B., *Thermodynamics and an Introduction to Thermostatistics*, 2nd ed., Wiley (1985).

[4] Kondepudi, D., & Prigogine, I., *Modern Thermodynamics*, Wiley (1998).

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The funneled spring is the geometry they generate.
Everything else is derived."

— Dexter Gilbert