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The Supreme Law of Contradictions (SLC)
A Universal Principle of Survival, Destruction, and the Duration of Structural Existence

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ABSTRACT

We introduce and formally define the *Supreme Law of Contradictions* (SLC), a universal theoretical principle asserting that every structure in the universe physical, biological, geological, cosmological, or social exists in a perpetual, irresolvable tension between two rigorously defined opposing quantities: a *Survival Force* $\mathcal{F}_S$, identified as the *exergy flux* delivered to the structure from its parent system, and a *Destruction Force* $\mathcal{F}_D$, identified as the *total rate of irreversible entropy production* within and at the boundaries of the structure. Both quantities are independently measurable from first principles, without reference to the outcome of the system. The non-negativity of $\mathcal{F}_D$ is guaranteed by the Second Law of Thermodynamics; the boundedness of $\mathcal{F}_S$ is guaranteed by the finite exergy budget of every parent system. Together, these two facts imply three universal claims: (i) no structure is exempt from destructive forces; (ii) survival is always temporary; (iii) destruction is the inevitable final state of every structure. We formalize this principle through the *Structural Dominance Ratio* $\Omega(t) = \mathcal{F}_S(t)/(T_0\mathcal{F}_D(t))$, derive conditions for growth, equilibrium, decline, and collapse, and provide a thermodynamically grounded derivation of the *Survival Duration Formula* T_{survival}, which quantifies the lifespan of any structure as a function of three measurable parameters: the exergy reservoir of the parent system E_{parent}, the mean entropy production rate $\bar{\sigma}_{\text{irr}}$, and the structural adaptation efficiency η_{adapt}. We demonstrate that the Second Law of Thermodynamics, Darwinian natural selection, and Prigogine's dissipative structures are domain-specific expressions of the same universal duality, and derive six independently falsifiable predictions spanning astrophysics, geology, ecology, and comparative biology.

I. INTRODUCTION

A. The Unifying Problem

Modern science has achieved extraordinary resolution at the level of individual phenomena. Physics describes the forces governing particles and spacetime. Biology describes the molecular mechanisms of cellular life. Geology describes the dynamics of planetary crust. Cosmology describes the large-scale evolution of the universe. Yet across all of these domains, a single structural pattern repeats with striking regularity and has never been formally identified as a universal law:

> *Every structure from a mountain to a star, from a cell to a civilization exists in a state of permanent tension between forces that build it and forces that destroy it. Its existence is the temporary victory of building over destruction. Its death is the inevitable final victory of destruction.*

This pattern has been observed in isolation within each field. Thermodynamics identifies entropy as the universal tendency toward disorder. Geology identifies orogeny and erosion as competing forces shaping mountains [7]. Biology identifies homeostasis as the active maintenance of order against chemical degradation [6]. Astrophysics identifies stellar equilibrium as the balance between gravitational collapse and radiation pressure [3]. Each of these is a correct, domain-specific observation. What has been missing is the recognition that all of them instantiate a single, deeper, universal law.

This paper proposes that law: the **Supreme Law of Contradictions** (SLC).

B. Central Claim

SLC holds that the duality between survival and destruction is not a property of any particular physical system but a *structural necessity of existence itself.* Any entity that exists must continuously receive low-entropy energy (exergy) from a parent system to counteract the irreversible entropy production that the Second Law guarantees within it. The moment that exergy supply becomes insufficient, the entity begins its irreversible dissolution. The total duration of an entity's existence is therefore a calculable quantity a function of the exergy available from the parent system, the rate of irreversible entropy production, and the efficiency with which the entity converts available exergy into structural maintenance.

SLC does not replace established physical laws. It reveals that several foundational laws in physics and biology describe the same universal duality from different domain-specific perspectives, each capturing a particular expression of the opposition between exergy-driven order maintenance and entropy-driven dissolution.

C. Relationship to Prior Work

Two domain-specific formalizations of the contradictions principle have been previously explored by the present author: the *Cosmic Anchor Hypothesis* (CAH) [1], which applies the survival-destruction duality to cosmological large-scale stability, and the *Morphogenic Tension Principle* (MTP) [2], which applies it to multicellular integrity and oncogenesis. Both remain preprints under development. The present paper establishes the universal thermodynamic framework of which those domain-specific studies are intended as instantiations; independent experimental validation of the domain-specific predictions is the subject of ongoing work.

II. THE DUALITY OF FORCES

The central advance of SLC over prior qualitative frameworks is the grounding of its two fundamental quantities in measurable thermodynamic observables that are defined *independently of the system's outcome*. No domain-specific free parameters are introduced at the foundational level; the definitions below apply without modification to stars, mountains, organisms, and inanimate objects alike.

A. The Destruction Force $\mathcal{F}_D$: Irreversible Entropy Production

Definition 1 (Destruction Force)**.** The *Destruction Force* of a structure $\mathcal{E}$ occupying volume $\mathcal{V}$ at time t is the total rate of irreversible entropy production within and at the boundaries of $\mathcal{E}$:

$$\mathcal{F}_D(t) \;\equiv\; \sigma_{\mathrm{irr}}(t) \;=\; \int_{\mathcal{V}} \sigma_{\mathrm{local}}(\mathbf{r},t)\, dV \;\geq\; 0, \qquad (1)$$

where $\sigma_{\mathrm{local}}(\mathbf{r},t) \geq 0$ is the local entropy production rate density (units: $\mathrm{W\,K^{-1}\,m^{-3}}$).

The non-negativity $\mathcal{F}_D \geq 0$ is not a postulate of SLC but a consequence of the Second Law of Thermodynamics (Clausius inequality applied locally). No physical process in any domain, at any scale can achieve $\mathcal{F}_D = 0$ except in the idealized limit of perfect thermodynamic reversibility, which is unattainable in finite time. A wooden table at room temperature, a granite mountain, a living neuron, and a main-sequence star all satisfy $\mathcal{F}_D > 0$ continuously. This is the first universal invariant of SLC.

Remark 1. $\mathcal{F}_D$ is defined entirely from the thermodynamic state of $\mathcal{E}$ and its boundary, without reference to any outcome or survival status. It can in principle be computed from first principles (molecular dynamics, continuum thermodynamics) or measured calorimetrically. Its universality and positivity follow from physics, not from definition.

B. The Survival Force $\mathcal{F}_S$: Exergy Flux from the Parent System

Definition 2 (Survival Force)**.** The *Survival Force* of a structure $\mathcal{E}$ is the exergy flux delivered to $\mathcal{E}$ from its parent system $\mathcal{P}$:

$$\mathcal{F}_S(t) \;\equiv\; \dot{E}_{\mathrm{in}}(t) - T_0\, \dot{S}_{\mathrm{in}}(t), \qquad (2)$$

where $\dot{E}_{\mathrm{in}}$ is the rate of total energy input from $\mathcal{P}$, $\dot{S}_{\mathrm{in}}$ is the rate of entropy carried with that energy, and T_0 is the ambient reference temperature of the environment (units of $\mathcal{F}_S$: W).

Exergy is the thermodynamically rigorous measure of useful work capacity: it quantifies not merely the quantity of energy input but its *quality* its ability to drive structural processes against the tendency toward disorder. High-exergy inputs (nuclear energy, metabolic substrates, tectonic heat) sustain high $\mathcal{F}_S$; low-exergy inputs (thermal radiation at ambient temperature) contribute negligibly to $\mathcal{F}_S$.

Remark 2. For a purely inanimate structure with no energy input mechanism (e.g., a glass object, a wooden table), $\dot{E}_{\mathrm{in}} \approx 0$ and $\mathcal{F}_S \approx 0$. The structure possesses a finite exergy content stored in its chemical bonds and crystalline organization, but this is a reservoir that depletes over time under the action of $\mathcal{F}_D$, rather than a continuous flow. Such structures therefore satisfy $\Omega \to 0$ unconditionally: their deterioration is not a contingent outcome but a thermodynamic certainty on any finite timescale.

Table 1 presents the domain-specific expressions of $\mathcal{F}_S$ and $\mathcal{F}_D$ for six primary instantiations. In each case, the general thermodynamic definitions of Eqs. (1)–(2) reduce to the established domain-specific quantities when the appropriate physical model is applied.

III. THE ADAPTIVE INFORMATION THRESHOLD

The preceding section defines $\mathcal{F}_S$ and $\mathcal{F}_D$ in terms of independently measurable thermodynamic quantities but treats the adaptation efficiency η_{adapt} as a static parameter to be determined empirically for each system. This section derives η_{adapt} dynamically from statistical mechanics, establishing it as a function of the system's accumulated information content $I(t)$. The result provides a causal mechanism not merely a description for the decline of $\Omega(t)$ in highly specialized structures, and a thermodynamic explanation for a class of structural collapses that exergy depletion alone does not predict.

A. Adaptive Units and the Two-State Model

Definition 3 (Adaptive Unit)**.** An *adaptive unit* (AU) of structure $\mathcal{E}$ is any internal degree of freedom capable of reconfiguring in response to an environmental perturbation. For a biological organism, AUs include regulatory gene networks, synaptic configurations, and metabolic pathways. For an ecosystem, AUs are species-level functional roles. For a star, AUs are the magnetohydrodynamic modes of the convective envelope.

Each AU_j ($j = 1, \dots, N$) occupies one of two states:

- *Open* ($\mathcal{O}$): the unit is structurally plastic and contributes actively to η_{adapt};
- *Locked* ($\mathcal{L}$): the unit is committed to an existing structural pattern encoded in response to a prior environmental signal and no longer contributes to η_{adapt}.

The total information content of $\mathcal{E}$ at time t is proportional to the number of locked units:

$$I(t) \;=\; \frac{N_{\mathcal{L}}(t)}{N}\, I_{\max}, \tag{3}$$

where $I_{\max}$ is the finite information capacity of $\mathcal{E}$ (Subsection 3.3) and $N_{\mathcal{L}}$ is the number of AUs in state $\mathcal{L}$.

B. Thermodynamic Derivation of the Sigmoid Form

The energy difference between states $\mathcal{O}$ and $\mathcal{L}$ for AU_j is not constant but depends on the existing information density $I/I_{\max}$. When I is low, remaining open is energetically inexpensive: the structural environment accommodates plasticity freely. As I increases, the existing information network imposes internal rigidity, raising the energetic cost of maintaining plasticity:

$$\Delta E_j(I) \;\equiv\; E_{\mathcal{O}} - E_{\mathcal{L}} \;=\; -\varepsilon_0 + \gamma\,\frac{I}{I_{\max}}, \tag{4}$$

where $\varepsilon_0 > 0$ is the intrinsic entropic preference for the open state (the conformational-entropy advantage of plasticity) and $\gamma > 0$ is the *rigidity coupling constant*, which measures the rate at which accumulated information raises the cost of additional plasticity.

Applying the Boltzmann distribution at effective internal temperature T_{eff} (the thermodynamic noise amplitude of the system's internal regulatory environment):

$$P_{\mathcal{O}}(I) \;=\; \frac{1}{Z}\, e^{-E_{\mathcal{O}}/k_B T_{\text{eff}}} \;=\; \frac{1}{1 + \exp(\Delta E_j(I)/k_B T_{\text{eff}})}. \tag{5}$$

Substituting Eq. (4) into Eq. (5) and defining the two derived parameters:

$$I_c \;\equiv\; \frac{\varepsilon_0}{\gamma}\, I_{\max}, \tag{6}$$

$$\kappa \;\equiv\; \frac{\gamma}{k_B T_{\text{eff}}}, \tag{7}$$

we obtain:

$$P_{\mathcal{O}}(I) \;=\; \frac{1}{1 + \exp\!\left(\kappa\, \dfrac{I - I_c}{I_{\max}}\right)}. \tag{8}$$

Here I_c is the *critical information content*: the value at which the open and locked states are energetically degenerate and $P_{\mathcal{O}} = 1/2$. The parameter κ is the *rigidity parameter*: it governs how sharply adaptation efficiency collapses around I_c.

Since all N AUs are statistically equivalent under the mean-field approximation (each experiences the same mean information pressure $I/I_{\max}$), the global adaptation efficiency is the mean occupancy of state $\mathcal{O}$:

$$\boxed{\eta_{\text{adapt}}(I) \;=\; \eta_{\max} \cdot P_{\mathcal{O}}(I) \;=\; \frac{\eta_{\max}}{1 + \exp(\kappa\,(I - I_c)/I_{\max})}} \tag{9}$$

This is the *Fermi-Dirac* form, derived here not by assumption but as the necessary consequence of Boltzmann statistics applied to the two-state adaptive-unit model under a mean-field information pressure. Three limiting cases recover known behaviors:

1. $I \ll I_c$: $\eta_{\text{adapt}} \approx \eta_{\max}$ (early-life, high-plasticity regime the approximation implicit in the original Eq. 21);
2. $I = I_c$: $\eta_{\text{adapt}} = \eta_{\max}/2$ (critical threshold; transition from predominantly open to predominantly locked);
3. $I \gg I_c$: $\eta_{\text{adapt}} \to 0$ (saturation; full informational rigidity, structural collapse becomes inevitable regardless of exergy supply).

C. Bounded Information Capacity

The derivation above requires $I_{\max} < \infty$. This is not an additional assumption but a consequence of the physical constraints on $\mathcal{E}$:

Postulate 1 (Finite Information Capacity)**.** *For any physical structure $\mathcal{E}$ of energy E and spatial extent R, the total storable information is bounded above by the Bekenstein bound [10]:*

$$I_{\max} \;\le\; \frac{2\pi k_B\, R\, E}{\hbar c}, \tag{10}$$

which is finite for all structures with finite energy and spatial extent. In biological and ecological systems, $I_{\max}$ is determined in practice by the informational capacity of the physical substrate (genome length, neural connectivity, species count), all of which are finite and independently measurable prior to observing the system's lifespan.

D. Dynamics of Information Accumulation

The rate at which $I(t)$ increases is proportional to the exergy flux $\mathcal{F}_S$ available for encoding new structural patterns and to the fraction of AUs still open:

$$\frac{dI}{dt} = \alpha\,\mathcal{F}_S(t)\left(1 - \frac{I}{I_{\max}}\right), \tag{11}$$

where $\alpha > 0$ ($\mathrm{K\,J^{-1}}$) is the *information transduction efficiency*: the fraction of incoming exergy that results in structural encoding rather than pure heat dissipation. Eq. (11) is a logistic growth law for I with carrying capacity $I_{\max}$, ensuring $I(t) \to I_{\max}$ as $t \to \infty$ in any system receiving nonzero exergy.

Remark 3. Equations (9) and (11) together constitute the *Adaptive Information Threshold* (AIT) mechanism. As a system accumulates information by adapting to its environment, it simultaneously narrows its capacity for future adaptation. This is the thermodynamic cause not merely the description of the collapse observed when highly specialized systems encounter novel environmental perturbations.

E. Updated Survival Duration Under AIT

With η_{adapt} given by Eq. (9), the survival interval decomposes into two analytically distinct phases separated by I_c.

Phase I ($I < I_c$, $\eta_{\mathrm{adapt}} \approx \eta_{\max}$): The system operates in the high-plasticity regime. Integrating Eq. (11) at constant mean flux $\bar{F}_S$ from $I(0) = 0$ to $I(T_1) = I_c$:

$$T_1 \approx \frac{I_{\max}}{\alpha \bar{F}_S} \ln\left(\frac{I_{\max}}{I_{\max} - I_c}\right). \tag{12}$$

Phase II ($I \geq I_c$, $\eta_{\mathrm{adapt}} \leq \eta_{\max}/2$): The onset of Phase II finds the system at half-efficiency. Applying the quasi-steady-state approximation of Eq. (21) to the remaining exergy budget at effective efficiency $\eta_{\max}/2$:

$$T_2 \approx \frac{\frac{1}{2}\eta_{\max} E_{\mathrm{parent}} - \bar{F}_S\, T_1}{T_0\, \bar{\sigma}_{\mathrm{irr}}\, m_{\mathcal{E}}}. \tag{13}$$

The full survival duration is therefore:

$$\boxed{T_{\mathrm{survival}} \approx \underbrace{\frac{I_{\max}}{\alpha \bar{F}_S} \ln\left(\frac{I_{\max}}{I_{\max} - I_c}\right)}_{T_1\text{: plastic phase}} + \underbrace{\frac{\frac{1}{2}\eta_{\max} E_{\mathrm{parent}} - \bar{F}_S\, T_1}{T_0\, \bar{\sigma}_{\mathrm{irr}}\, m_{\mathcal{E}}}}_{T_2\text{: rigid phase}}} \tag{14}$$

Equation (21) is recovered in the limit $I_c \to I_{\max}$ (a system whose critical threshold coincides with maximal capacity, i.e., one that never rigidifies), with $\eta_{\mathrm{adapt}} \to \eta_{\max}$.

Remark 4. Eq. (14) predicts a category of structural collapse absent from Eq. (21): a system can terminate not because its parent system's exergy is exhausted ($E_{\mathrm{parent}} \to 0$) but because internal information saturation has driven $\eta_{\mathrm{adapt}} \to 0$. This is the thermodynamic mechanism of *specialization-induced collapse*: the failure of a highly adapted structure when its environment shifts beyond the range encoded in its locked AUs.

IV. FORMAL STATEMENT OF SLC

A. Verbal Formulation

The Supreme Law of Contradictions (Ghazouani, 2026). Every structure $\mathcal{E}$ in the universe exists in a state of perpetual tension between a *Survival Force* $\mathcal{F}_S(t)$ the exergy flux from the containing parent system and a *Destruction Force* $\mathcal{F}_D(t)$ the total rate of irreversible entropy production within $\mathcal{E}$. The Second Law of Thermodynamics guarantees $\mathcal{F}_D(t) > 0$ at all times for any physical structure. The finite exergy budget of every parent system guarantees that $\mathcal{F}_S(t)$ is bounded above and cannot be sustained indefinitely. These two facts together imply that the structural dominance ratio $\Omega(t) = \mathcal{F}_S(t)/(T_0\mathcal{F}_D(t))$ must satisfy $\Omega(t) \to 0$ as $t \to \infty$ for every structure without exception. The existence of any structure is therefore always temporary: a finite interval during which exergy supply from the parent system exceeds the thermodynamic cost of maintaining structural integrity.

B. The Structural Dominance Ratio

Definition 4 (Structural Dominance Ratio)**.** The *Structural Dominance Ratio* of entity $\mathcal{E}$ at time t is the dimensionless ratio of survival force to the thermodynamic cost of the destruction force:

$$\Omega(t) \equiv \frac{\mathcal{F}_S(t)}{T_0\,\mathcal{F}_D(t)} = \frac{\dot{E}_{\mathrm{in}}(t) - T_0\,\dot{S}_{\mathrm{in}}(t)}{T_0\,\sigma_{\mathrm{irr}}(t)}, \tag{15}$$

defined for $\sigma_{\mathrm{irr}}(t) > 0$ (guaranteed by the Second Law). Both numerator and denominator are independently measurable thermodynamic quantities.

C. Universal State Conditions

The four universal states of any structure follow directly from Eq. (15):

$$\textit{Growth:}\quad \Omega(t) > 1 \;\Leftrightarrow\; \mathcal{F}_S > T_0\mathcal{F}_D \tag{16}$$

$$\textit{Equilibrium:}\quad \Omega(t) = 1 \;\Leftrightarrow\; \mathcal{F}_S = T_0\mathcal{F}_D \tag{17}$$

$$\textit{Decline:}\quad 0 < \Omega(t) < 1 \;\Leftrightarrow\; \mathcal{F}_S < T_0\mathcal{F}_D \tag{18}$$

$$\textit{Death:}\quad \lim_{t \to t_d} \Omega(t) = 0 \tag{19}$$

Note that equilibrium (Eq. 17) is not a resting state but a dynamic balance requiring continuous exergy input. A structure at $\Omega = 1$ that loses its exergy supply will immediately transition to Eq. (18), since $\mathcal{F}_D > 0$ continues unabated.

D. Thermodynamic Derivation of the Survival Duration Formula

We now derive the survival duration T_{survival} from first principles, without introducing free parameters.

The total exergy budget available to $\mathcal{E}$ from its parent system $\mathcal{P}$ over its entire existence is bounded by the finite exergy stored in $\mathcal{P}$:

$$E_{\text{ex}} = \int_0^{T_{\text{survival}}} \mathcal{F}_S(t)\,dt \;\le\; \eta_{\text{adapt}}\,E_{\text{parent}}, \qquad (20)$$

where E_{parent} is the total exergy stored in $\mathcal{P}$ and $\eta_{\text{adapt}} \in [0,1]$ is the fraction of that exergy that $\mathcal{E}$ can convert into effective structural maintenance a measurable thermodynamic efficiency, not a free parameter.

The structure survives (i.e., $\Omega(t) > \theta_c$) only while the exergy supply rate exceeds the thermodynamic cost of maintaining structural integrity, which equals $T_0\,\sigma_{\text{irr}}(t)$. Integrating over the survival interval and invoking the budget constraint (Eq. 20) in the quasi-steady-state approximation ($\sigma_{\text{irr}} \approx \bar{\sigma}_{\text{irr}} = \text{const}$):

$$\boxed{T_{\text{survival}} \;\approx\; \frac{\eta_{\text{adapt}} \cdot E_{\text{parent}}}{T_0\,\bar{\sigma}_{\text{irr}} \cdot m_{\mathcal{E}}}} \qquad (21)$$

where $m_{\mathcal{E}}$ is the structural mass of $\mathcal{E}$ (setting the energy scale of maintenance per unit time) and $\bar{\sigma}_{\text{irr}}$ is the time-averaged entropy production rate per unit mass (units: $\mathrm{W\,K^{-1}\,kg^{-1}}$). All three parameters E_{parent}, $\bar{\sigma}_{\text{irr}}$, and η_{adapt} are independently measurable from the thermodynamic state of the parent system and the structure, prior to and independently of observing the actual lifespan.

Remark 5. Equation (21) encodes the three universal determinants of structural lifespan: the richness of the parent system (E_{parent} large $\Rightarrow$ longer survival), the rate of destruction ($\bar{\sigma}_{\text{irr}}$ small $\Rightarrow$ longer survival), and the efficiency of structural adaptation (η_{adapt} large $\Rightarrow$ longer survival). These are the only three levers available to any structure in any domain.

E. The Parent System Dependency

A critical structural claim of SLC follows directly from Eq. (2):

Postulate 2 (Parent Dependency)**.** *No structure $\mathcal{E}$ sustains $\mathcal{F}_S > 0$ from internal resources alone. Every survival force draws its exergy from a containing parent system $\mathcal{P}$. When $\mathcal{P}$ is exhausted or disrupted, $\mathcal{F}_S \to 0$ and $\Omega(t)$ declines toward zero, regardless of the internal state of $\mathcal{E}$.*

This postulate establishes a universal hierarchy of dependence:

$$\mathcal{E}_1 \subset \mathcal{P}_1 \subset \mathcal{P}_2 \subset \cdots \subset \mathcal{P}_N, \qquad (22)$$

where each level draws exergy from the level above. The lifespan of $\mathcal{E}_1$ is therefore bounded above by the lifespan of every parent system containing it. No entity outlives its parent.

V. DOMAIN INSTANTIATIONS

SLC is universal. Its instantiation in any particular domain requires only the specification of the physical processes that contribute to σ_{irr} and the exergy flux $\mathcal{F}_S = \dot{E}_{\text{in}} - T_0\dot{S}_{\text{in}}$ appropriate to that domain. Table 1 presents six primary instantiations. Each is a known empirical domain; the novelty of SLC is the identification of their common mathematical structure.

A. Astrophysical Instantiation: Stars

A star is the archetype of a SLC system. Its exergy input is the outward radiation pressure generated by nuclear fusion, whose specific exergy per unit mass is $\xi_{\text{nuc}} = f_H\,c^2 \approx 6.3\times10^{14}\,\mathrm{J\,kg^{-1}}$. Its irreversible entropy production arises from gravitational dissipation and radiative losses. The Structural Dominance Ratio reduces to the virial theorem condition:

$$\Omega_\star(t) = \frac{P_{\text{rad}}(t)}{T_0\,P_{\text{grav}}(t)/T_\star} \approx \frac{L(t)/c}{GM_\star^2/R_\star^2}, \qquad (23)$$

where $L(t)$ is the stellar luminosity, $M_\star$ the mass, and $R_\star$ the radius. The main sequence corresponds to $\Omega_\star \approx 1$. When the hydrogen fuel is exhausted, $\dot{E}_{\text{in}} \to 0$, $\mathcal{F}_S \to 0$, $\Omega_\star \to 0$, and the star undergoes gravitational collapse the stellar instantiation of Eq. (19). Substituting into Eq. (21):

$$T^{(\star)}_{\text{survival}} \approx \frac{0.1\,f_H\,M_\star c^2}{L_\star}, \qquad (24)$$

where $f_H \approx 0.007$ is the nuclear efficiency of hydrogen fusion. This is the standard stellar lifetime formula here derived as the astrophysical expression of the universal Eq. (21), with $E_{\text{parent}} = 0.1 f_H M_\star c^2$ (the nuclear exergy reservoir) and $T_0\bar{\sigma}_{\text{irr}} m_\star = L_\star$ (the luminosity as the dominant entropy production channel).

B. Geological Instantiation: Mountains

A mountain's exergy input is the geothermal energy driving tectonic uplift; its irreversible entropy production arises from weathering, chemical oxidation, and gravitational mass wasting [7]. These are directly measurable quantities. The Structural Dominance Ratio takes the form:

$$\Omega_{\text{mtn}}(t) = \frac{\dot{U}(t)}{T_0\,\dot{E}(t)/T_{\text{rock}}} \approx \frac{\dot{U}(t)}{\dot{E}(t)}, \qquad (25)$$

where $\dot{U}$ is the uplift rate (mm/yr) and $\dot{E}$ is the erosion rate (mm/yr), both being measurable expressions of the thermodynamic quantities in Eq. (15). Mountain growth ($\dot{U} > \dot{E}$, $\Omega > 1$) gives way to erosional equilibrium ($\dot{U} = \dot{E}$, $\Omega = 1$) and ultimately to plain formation ($\dot{U} \to 0$, $\Omega \to 0$) as mantle convection the parent system's exergy supply weakens with planetary cooling. The exergy budget E_{parent} of this parent system is the geothermal energy stored in the mantle, itself powered by radioactive isotope decay a finite reservoir whose exhaustion will eventually terminate all mountain-building on Earth.

C. Biological Instantiation: The MTP Connection

The Morphogenic Tension Principle [2] is a domain-specific model of SLC for multicellular organisms, in which the exergy flux $\mathcal{F}_S$ corresponds to the energy invested

Table 1: Domain instantiations of the Supreme Law of Contradictions. In every case, $\mathcal{F}_S$ is the domain-specific expression of the exergy flux (Eq. 2) and $\mathcal{F}_D$ is the domain-specific expression of the irreversible entropy production rate (Eq. 1). The Structural Dominance Ratio $\Omega = \mathcal{F}_S/(T_0\mathcal{F}_D)$ takes the same universal form across all domains.

Domain	**Survival Force $\mathcal{F}_S$**	**Destruction Force $\mathcal{F}_D$**	**Parent System $\mathcal{P}$**
Astrophysics (Stars)	Nuclear radiation pressure, thermal energy	Gravitational collapse, mass loss	Galactic hydrogen reservoir
Cosmology (CAH)	Stellar anchor network, gravitational confinement	Dark energy expansion, compact remnant accumulation	Total stellar mass budget of universe
Geology (Mountains)	Tectonic uplift, isostatic rebound	Erosion, weathering, gravitational mass wasting	Mantle convection, geothermal energy
Biology (MTP)	Morphogenic force: differentiation, apoptosis, contact inhibition	Amorphogenic force: undifferentiated proliferation, immune escape	Organism's metabolic energy supply
Ecology (Ecosystems)	Biodiversity, nutrient cycles, predator-prey regulation	Species extinction, habitat degradation, invasive species	Solar energy flux, planetary geochemistry
Thermodynamics	Negentropy input (energy dissipation through structure)	Entropy production, equilibration	External free energy source

in differentiation, apoptosis, and contact inhibition, while $\mathcal{F}_D$ corresponds to the entropy produced by uncontrolled proliferation and immune escape. The morphogenic dominance index $\Phi(t)$ of MTP is a domain-specific approximation of $\Omega(t)$:

$$\Omega_{\text{bio}}(t) \;\approx\; \Phi(t) \;=\; \frac{C_{\text{diff}} \cdot K_{\text{apop}} \cdot \sigma_{\text{inh}}}{C_{\text{undiff}} \cdot K_{\text{prol}} \cdot \varepsilon_{\text{esc}}}, \tag{26}$$

with the oncogenic transition corresponding to $\Omega_{\text{bio}} \leq \Theta$ and organismal decline to $\Omega_{\text{bio}} \to 0$. The MTP formulation represents a preliminary quantitative instantiation; independent experimental validation of its parameters against the thermodynamic definitions of Eqs. (1)–(2) is the subject of ongoing work [2].

D. Cosmological Instantiation: The CAH Connection

The Cosmic Anchor Hypothesis [1] is the cosmological instantiation of SLC. The large-scale stability of the universe is the survival-force regime; the accelerating expansion driven by dark energy is the destruction-force regime. The dominance ratio is:

$$\Omega_{\cos}(t) \;=\; \frac{\mathcal{G}[\{\mathbf{r}_i\}, t]}{\mathcal{E}(t)} \;=\; \frac{G\, M_{\text{eff}}(t)/R_{\text{eff}}^2}{\Lambda c^2\, R_{\text{eff}}/3}, \tag{27}$$

where $M_{\text{eff}}(t) = \sum_i \eta_i m_i$ is the effective anchor mass weighted by the anchor effectiveness factor $\eta_i = 1 - 2Gm_i/(R_i c^2)$ [1], and R_{eff} is the characteristic scale of the anchor network. Stellar death transfers mass from $\eta \approx 1$ (active stars) to $\eta \to 0$ (black holes), irreversibly reducing M_{eff} and driving $\Omega_{\cos} \to 0$ on cosmological timescales.

VI. UNIFICATION OF ESTABLISHED LAWS

SLC does not contradict established physical laws. Rather, it reveals that several foundational laws in physics and biology are special cases of the same universal principle.

A. Second Law of Thermodynamics

The Second Law states that the entropy of a closed system monotonically increases [4]. In SLC terms, this is the statement that $\mathcal{F}_D$ always acts (entropy always increases), and that $\mathcal{F}_S$ requires a continuous external energy input to maintain $\Omega \geq 1$. When external energy ceases, $\mathcal{F}_S \to 0$ and $\Omega \to 0$ thermodynamic equilibrium. SLC generalizes the Second Law by specifying the survival-force mechanisms that create the negentropy required to locally oppose entropy production, and by quantifying the duration of this local opposition through Eq. (21).

B. Darwinian Natural Selection

Natural selection describes the survival of structures better adapted to their environment [5]. In SLC terms, fitness is precisely η_{adapt} in Eq. (21): organisms with higher adaptation efficiency convert more of the parent system's energy into survival-force activity and therefore have longer T_{survival}. Evolution is the process by which η_{adapt} increases across generations through differential reproduction. Natural selection is therefore the biological mechanism by which $\eta_{\max}$ is optimized under the universal constraint of SLC. However, as established in Section 3, η_{adapt} is not a monotonically increasing quantity: when a lineage's accumulated specialization approaches I_c, adaptation efficiency begins to decline (Eq. 9) even as selection pressure continues to act. Selection can extend I_c and raise $\eta_{\max}$ but cannot circumvent the Boltzmann saturation of the AIT mechanism. This provides the thermodynamic cause for the empirical observation that highly specialized lineages face elevated extinction risk in rapidly shifting environments a causal prediction, not a post-hoc description.

C. Prigogine's Dissipative Structures

Prigogine demonstrated that ordered structures far from thermal equilibrium are maintained through continuous energy dissipation [8]. The SLC framework subsumes this:

dissipative structures are precisely those for which $\mathcal{F}_S$ is non-zero and $\Omega \geq 1$ is maintained by continuous energy throughput from the parent system. Prigogine's theory describes the *mechanism* of the survival force in non-equilibrium systems; SLC places this mechanism within the universal duality.

Theorem 1 (SLC Correspondence)**.** *Let $\mathcal{L}$ be any physical, biological, or cosmological law that describes the maintenance of structural order in a system receiving energy from an external source, against the tendency toward disorder. Then $\mathcal{L}$ is expressible as a domain-specific constraint on the Structural Dominance Ratio, with:*

$$\begin{aligned} \mathcal{F}_S^{(\mathcal{L})} &= \text{exergy flux identified by } \mathcal{L}, \\ \mathcal{F}_D^{(\mathcal{L})} &= \text{entropy production identified by } \mathcal{L}, \end{aligned} \tag{28}$$

and the domain-specific survival condition of $\mathcal{L}$ corresponds to $\Omega^{(\mathcal{L})} > \theta_c$ for some domain-specific threshold θ_c. The universal claim of SLC that $\Omega \to 0$ is inevitable then follows from the Second Law applied to the domain-specific quantities, without additional assumptions.

Remark 6. This correspondence is not trivial: it demonstrates that the inevitability of structural termination in each domain is a consequence of the same thermodynamic fact (the positivity of entropy production and the finiteness of exergy), not of domain-specific mechanisms. The mechanisms differ; the logical structure does not.

VII. THE THREE UNIVERSAL CLAIMS

The SLC makes three irreducible universal claims, each with empirical content:

Postulate 3 (Universality of Duality)**.** *Every structure in the universe, without exception, satisfies both $\mathcal{F}_S \geq 0$ and $\mathcal{F}_D > 0$ simultaneously. The strict positivity of $\mathcal{F}_D$ follows from the Second Law; the non-negativity of $\mathcal{F}_S$ follows from the definition of exergy. No structure exists without an ongoing destruction force, and no structure persists without some survival force even if that survival force is merely the binding energy of its chemical bonds (a finite, depleting reservoir that makes destruction inevitable in finite time).*

Postulate 4 (Inevitability of Destruction)**.** *For every structure $\mathcal{E}$:*

$$\lim_{t\to\infty} \Omega(t) = 0. \tag{29}$$

Proof sketch: (i) $\mathcal{F}_D > 0$ always (Second Law). (ii) $E_{\text{parent}} < \infty$ always (every parent system has finite exergy). (iii) Therefore $\int_0^\infty \mathcal{F}_S\, dt \leq \eta_{\text{adapt}} E_{\text{parent}} < \infty$. (iv) Since $\mathcal{F}_S$ is bounded and $\int_0^\infty FD\, dt$ diverges (the integral of a strictly positive quantity over infinite time), $\Omega(t) \to 0$ is necessary. □

Postulate 5 (Temporary Victory of Survival)**.** *The period $[0, T_{\text{survival}}]$ during which $\Omega(t) > \theta_c$ is finite and given in full by Eq. (14). Longer survival requires a richer parent system (E_{parent} large), slower entropy production ($\bar{\sigma}_{\text{irr}}$ small), or higher initial adaptation efficiency ($\eta_{\max}$ close to 1). Additionally, Eq. (14) establishes two further levers: a higher critical information threshold I_c (structures that remain plastic to larger information loads) and a lower rigidity parameter κ (structures whose transition from open to locked AUs is gradual rather than abrupt). These five parameters jointly determine lifespan in any domain; the original three-parameter formula Eq. (21) is recovered in the limit $I_c \to I_{\max}$.*

VIII. DYNAMIC BEHAVIOR AND PHASE TRANSITIONS

The temporal evolution of $\Omega(t)$ follows a generic trajectory determined by the balance of exergy supply and entropy production:

$$\frac{d\Omega}{dt} = \frac{1}{T_0 \mathcal{F}_D} \frac{d\mathcal{F}_S}{dt} - \frac{\mathcal{F}_S}{T_0 \mathcal{F}_D^2} \frac{d\mathcal{F}_D}{dt}. \tag{30}$$

Four qualitatively distinct regimes emerge:

(i) Growth phase ($d\Omega/dt > 0$, $\Omega > 1$): the structure expands, consolidates, and increases its capacity to resist destruction. Examples: main-sequence star accretion, mountain uplift exceeding erosion, embryonic development.

(ii) Homeostatic equilibrium ($d\Omega/dt \approx 0$, $\Omega \approx 1$): the structure maintains itself against destruction through continuous active expenditure. This is the most energy-intensive state. Examples: adult organism, stable mountain range, main-sequence stellar equilibrium.

(iii) Secular decline ($d\Omega/dt < 0$, $0 < \Omega < 1$): destruction forces accumulate faster than survival forces can be replenished. The decline may be slow (aging) or rapid (acute disease, supernova). Examples: senescent organism, eroding mountain, dying star.

(iv) Irreversible collapse ($\Omega \leq \theta_c$, $d\Omega/dt \ll 0$): the critical threshold is crossed; positive feedback loops accelerate destruction and recovery becomes impossible. Examples: oncogenic transition, stellar core collapse, mountain range leveled to plains.

The transition from regime (ii) to regime (iii) may be gradual or may exhibit the properties of a phase transition, depending on whether the Hessian of the stability functional has a positive minimum eigenvalue [1]. In systems with strong nonlinear feedback (biological systems, stellar cores), the transition is typically sharp and discontinuous.

IX. THE INFORMATION INTERPRETATION

A deeper perspective on SLC emerges from information theory. The survival force can be reinterpreted as the mechanism by which a structure encodes and preserves information about its own organization. When $\Omega > 1$, the structure is gaining information (building more complex organization than it loses). When $\Omega < 1$, it is losing information to the environment faster than it can reconstruct it.

The Shannon information content of a structure's organization is:

$$\mathcal{I}[\mathcal{E}] \;=\; -\sum_i p_i \log p_i, \tag{31}$$

where p_i is the probability distribution over the microstates consistent with the structure's macro-state. The survival force maintains $\mathcal{I}$ against the entropic tendency to uniformize p_i. Death corresponds to maximum entropy: all p_i equal, $\mathcal{I} = 0$.

This connects SLC to the holographic principle [10] and to Jacobson's thermodynamic interpretation of general relativity [11]: the maintenance of structural information is physically equivalent to the maintenance of low-entropy organization against the Second Law.

X. OBSERVATIONAL PREDICTIONS

SLC yields six independently falsifiable predictions, spanning multiple empirical domains.

A. P1 Universal Lifespan Scaling and the AIT Correction

From Eq. (14), the lifespan T_{survival} of any structure decomposes into a plastic phase of duration T_1 and a rigid phase of duration T_2, governed by five independently measurable parameters: $\eta_{\max}$, E_{parent}, $\bar{\sigma}_{\text{irr}}$, I_c, and κ. In the limit $I_c \to I_{\max}$ (no specialization-induced collapse), the scaling reduces to Eq. (21):

$$T_{\text{survival}} \;\propto\; \frac{\eta_{\max} \cdot E_{\text{parent}}}{T_0\, \bar{\sigma}_{\text{irr}}}, \tag{32}$$

which is the original cross-domain lifespan scaling. The AIT correction sharpens this prediction in two ways. First, for two structures with identical E_{parent} and $\bar{\sigma}_{\text{irr}}$ but different I_c, the one with higher I_c survives longer not because of greater exergy input but because of a higher informational plasticity threshold. Second, both structures should exhibit a characteristic two-phase lifespan: a prolonged period of high Ω followed by a sharp decline when $I(t)$ crosses I_c. In biology, this predicts that species with higher metabolic efficiency ($\eta_{\max}$) live longer at fixed body mass consistent with observed metabolic-longevity correlations [9] and additionally that species approaching ecological specialization limits should show abrupt rather than gradual fitness decline, a prediction testable against fossil-record extinction dynamics.

B. P2 Parent Collapse Triggers Offspring Collapse

Postulate 2 predicts that the disruption of a parent system $\mathcal{P}$ should trigger the decline of all structures it sustains, regardless of their internal Ω values. In ecology, the collapse of a keystone species (parent system for its ecosystem) should produce a measurable, coordinated decline in the Ω of dependent species within a timescale proportional to their $E_{\text{parent}}/\dot{D}$ ratios. This is testable using trophic cascade data from documented keystone-species removals.

C. P3 Cross-Domain Lifespan Ratio

The ratio of lifespans between two structures in different domains is now predictable from Eq. (14) with all five SLC+AIT parameters:

$$\frac{T^{(1)}_{\text{survival}}}{T^{(2)}_{\text{survival}}} \;=\; \frac{T^{(1)}_1 + T^{(1)}_2}{T^{(2)}_1 + T^{(2)}_2}, \tag{33}$$

where each T_1 and T_2 are given by Eqs. (12) and (13) respectively. In the limit where both structures have $I_c \to I_{\max}$ (no informational saturation), this reduces to the original ratio:

$$\frac{T^{(1)}_{\text{survival}}}{T^{(2)}_{\text{survival}}} \;\xrightarrow{I_c \to I_{\max}}\; \frac{\eta^{(1)}_{\max} \cdot E^{(1)}_{\text{parent}} \,/\, \bar{\sigma}^{(1)}_{\text{irr}}}{\eta^{(2)}_{\max} \cdot E^{(2)}_{\text{parent}} \,/\, \bar{\sigma}^{(2)}_{\text{irr}}}. \tag{34}$$

For astrophysical versus geological structures (stars vs. mountain ranges), the AIT correction is negligible since both are dominated by exergy depletion rather than informational saturation. For biological versus ecological structures, the correction is non-negligible and testable: the AIT framework predicts that the lifespan discrepancy between generalist and specialist species at fixed E_{parent} and $\bar{\sigma}_{\text{irr}}$ is attributable to differences in I_c and κ, independently measurable from genomic and ecological data.

D. P4 Threshold Universality

The critical ratio θ_c at which structures transition from decline to irreversible collapse should cluster around a universal value (or a narrow distribution) when Ω is normalized by its healthy-equilibrium value Ω_0:

$$\theta^*_c \;=\; \theta_c/\Omega_0 \;\approx\; \text{const.} \tag{35}$$

across domains. The MTP validation found $\bar{\Theta} \approx -2.20$ in $\log \Phi$ units across 16 cancer types [2]. If θ^*_c is truly universal, analogous thresholds in geological and astrophysical systems should yield similar normalized values. This is the sharpest cross-domain prediction of SLC.

E. P5 Adaptation Efficiency, Informational Threshold, and Longevity

The AIT framework refines the adaptation-efficiency prediction into two independently testable components.

P5a Efficiency component ($\eta_{\max}$): In any domain where two classes of structures face identical parent systems and destruction rates, the class with higher $\eta_{\max}$ should exhibit systematically longer plastic-phase duration T_1 and greater total T_{survival}. In oncology, this predicts that tumors facing immune systems with higher recognition efficiency (higher $\eta_{\max}$) are suppressed for longer periods before clinical emergence, testable with immune-profiling data from pre-malignant lesion cohorts.

P5b Threshold component (I_c): Independently of $\eta_{\max}$, structures with higher critical information thresholds I_c

should exhibit qualitatively different collapse dynamics: their decline should be abrupt rather than gradual, characterized by a sharp drop in Ω at the time $I(t) = I_c$, with the sharpness controlled by κ (Eq. 9). This distinguishes two empirically separable extinction mechanisms: (i) resource-depletion collapse ($E_{\text{parent}} \to 0$, gradual), predicted by Eq. (21); and (ii) specialization-induced collapse ($I \to I_c$, abrupt), predicted by Eq. (14). In ecology, specialist species should disproportionately appear in the abrupt-collapse category in fossil-record data, while generalist species should appear in the gradual-decline category. The ratio $I_c/I_{\max}$ for a given species is in principle estimable from measures of ecological niche breadth, providing an independent variable against which the sharpness of extinction events can be tested.

F. P6 Energy Expenditure as Predictor of Structural Complexity

From Eqs. (2) and (21), structures that invest more energy per unit time in their survival force should, at comparable $\dot{D}$, develop greater structural complexity (higher $\mathcal{I}$, Eq. 31). This predicts a positive correlation between metabolic rate per unit mass and organismal information complexity (measurable via genome size, neural complexity, or behavioral repertoire size) across species. This is testable against existing comparative physiology and genomics databases.

XI. DISCUSSION

A. What SLC Is Not

SLC is not a thermodynamic identity. The Second Law states that entropy increases; SLC states that survival forces can locally oppose entropy increase for a finite duration, and specifies what determines that duration. These are complementary, not redundant.

SLC is not vitalism. It does not assign special status to life. A mountain obeys SLC with the same rigor as a cell. The survival force is a physical functional category, not a metaphysical principle.

SLC is not dualism. The two forces are not philosophical opposites but measurable physical quantities whose ratio determines the state of the system.

B. The Philosophical Dimension

SLC carries a philosophical implication that is worth stating explicitly. If destruction is universal and inevitable, and if survival is always temporary, then the proper question about any structure is not *whether* it will be destroyed, but *how long* it will sustain its organization against destruction, and *how richly* it will develop during that time. Existence is not defined by permanence but by the intensity and complexity of the survival-force activity during the finite interval of $\Omega > \theta_c$.

This reframes the meaning of growth, health, and development across all domains: not as states to be maintained indefinitely, but as temporary achievements of the survival force over destruction achievements that are more or less prolonged, more or less complex, depending on the three parameters of Eq. (21).

C. Limitations

The present formulation of SLC has limitations that define the research program it generates. First, the quasi-steady-state approximation in Eq. (21) assumes slow variation of σ_{irr}; systems undergoing rapid phase transitions (supernova collapse, acute biological failure) require the full nonlinear form of Eq. (30). Second, the computation of σ_{irr} from first principles is tractable for simple physical systems (stars, inanimate objects) but requires coarse-grained models for complex biological and social systems; the mapping between domain-specific observables and the fundamental thermodynamic quantities of Eqs. (1)–(2) must be explicitly validated in each domain. Third, the threshold θ_c is domain-specific and must be determined empirically or from more detailed models; SLC predicts its existence and its role but not its numerical value from first principles alone. These are targets for future quantitative development and experimental validation.

XII. CONCLUSION

We have introduced the Supreme Law of Contradictions (SLC): the universal principle that every structure in the universe exists in permanent tension between a Survival Force $\mathcal{F}_S$ — the exergy flux from its parent system and a Destruction Force $\mathcal{F}_D$ its total rate of irreversible entropy production. The non-negativity of $\mathcal{F}_D$ and the finiteness of $\mathcal{F}_S$ are guaranteed by established physical law, not by assumption. The key contributions of this paper are:

- A rigorous thermodynamic definition of $\mathcal{F}_D$ as irreversible entropy production (Eq. 1) and $\mathcal{F}_S$ as exergy flux (Eq. 2), independently measurable from first principles without reference to the system's outcome;
- The Structural Dominance Ratio $\Omega(t) = \mathcal{F}_S/(T_0\mathcal{F}_D)$ (Eq. 15), providing a universal dimensionless measure of structural integrity across all domains;
- A thermodynamically grounded derivation of the Survival Duration Formula T_{survival} (Eq. 21), expressing lifespan as a function of three measurable thermodynamic parameters;
- A proof sketch (Postulate 2) that $\Omega \to 0$ is a necessary consequence of the Second Law and the finiteness of every parent system, not a phenomenological assumption;
- The demonstration that the Second Law of Thermodynamics, Darwinian natural selection, and Prigogine's dissipative structures express the same universal duality, each capturing the opposition between exergy-driven order maintenance and entropy-driven dissolution in their respective domains;

- Six independently falsifiable predictions (P1–P6) spanning astrophysics, geology, ecology, and comparative biology, derived from thermodynamic parameters that are measurable independently of the lifespan observations they are intended to predict.

The universe is not a place of things that exist. It is a place of things that are fighting to exist, each with a finite supply of exergy, each facing a patient and inevitable entropy. The Supreme Law of Contradictions is the law of that fight not its outcome, which is always the same, but its structure, its duration, and its complexity.

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NOTE ON THE NATURE OF THIS WORK

This paper constitutes the foundational theoretical statement of the *Supreme Law of Contradictions* research program. It is not an experimental or data-driven paper. Its primary contributions are: (i) the rigorous thermodynamic formalization of $\mathcal{F}_S$, $\mathcal{F}_D$, and Ω as independently measurable physical quantities; (ii) the derivation of the Survival Duration Formula T_{survival} from first principles without domain-specific free parameters; and (iii) the formulation of six independently falsifiable predictions (P1–P6) spanning astrophysics, geology, ecology, and biology.

The domain-specific instantiations presented in Section 5 are theoretical models, not empirical confirmations. The quantitative validation of P1–P6, and the explicit experimental mapping of domain observables to the thermodynamic quantities of Eqs. (1)–(2), are the subject of a dedicated sequence of domain-specific studies currently in preparation, of which the *Cosmic Anchor Hypothesis* [1] and the *Morphogenic Tension Principle* [2] represent the first two instantiations.

The role of this paper within that program is analogous to that of a framework paper in theoretical physics: to establish the universal structure, define the quantities, and state the predictions with sufficient precision that each domain-specific study can be independently evaluated against them.