


The Path to the Singularity: An Ideological History

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Introduction: The Inevitable Crisis?

This paper traces the deep historical and philosophical currents that have propelled human civilisation toward a "Resource Entropy Singularity"¹—a point of no return where the biophysical demands of the global economy overwhelm and irreversibly degrade the planetary systems upon which we depend. This crisis is often viewed through a purely material lens, as a failure of technology, overpopulation, or poor resource management (Meadows et al., 1972). I argue, however, that its roots are fundamentally ideological, originating in a series of historical-philosophical breaks that systematically and deliberately redefined humanity's relationship with the natural world (White, 1967) and, crucially, with the laws of thermodynamics.

This trajectory was not inevitable. It was the result of a specific worldview winning out over others, violently suppressing them, and then formalising its own assumptions into a supposedly "rational" and "scientific" system that rendered its own foundations invisible. This analysis traces this ideology from its mythological origins to its modern-day entrenchment, arguing that the current crisis is not a technical problem, but the logical end-point of a civilisational "operating system" (Daly, 1991) that is fundamentally at war with thermodynamic and biophysical reality. This analysis begins by locating the "original sin" of this trajectory not in a physical act, but in the foundational mythology of the West: the parable of Eden.

¹Here and throughout, footnotes marked 'SETE' refer to the formal variables within the companion technical paper, "Socio-Economic Thermodynamic Entropy (SETE) Model: The Political-Economy as an Inertial Mass Orbiting a Systemic Entropy Singularity". This paper's historical narrative, referred to as the 'Genesis model' in related discussions, is here being mapped to those formal variables. In this context, the Singularity (S_{RE}) is the state where resource regeneration (R_G) is irreversibly overwhelmed by systemic depletion (D_S).

In order to proceed with clarity across disciplinary boundaries, key terms used in the analysis are defined below:

Key Concepts and Definitions

- **Maximum Power Principle (MPP)** — A systems-ecology concept (Lotka; Odum) stating that complex systems evolve toward configurations that maximise useful energy throughput relative to available resources.
- **Exergy** — The fraction of a system's total energy that can perform work; unlike total energy, exergy is degraded and irrecoverably lost through irreversible processes.
- **Entropy** — A measure of disorder or energy dispersal. In the Earth system, entropy increases as low-entropy solar energy is converted into high-entropy waste heat.
- **Energetic Divergence** — The point in resource extraction where the energy required to acquire the next unit of resource is greater than the useful (net) energy gained, forcing an exponential increase in total energy throughput for diminishing returns.
- **Ideological Superstructure** — Following Marxian usage, the cultural and conceptual institutions that legitimise and stabilise a material base of production and power.
- **Scientism** — The use of scientific rhetoric or mathematical formalism to confer authority on claims that are ideological rather than empirical in nature.

1 The Eden Parable: A Myth for Ecological Alienation

The Book of Genesis, far from being a simple religious text, can be read as a profound documentation of the genesis of this destructive ideology (Quinn, 1992). It is highly probable that its original authors and the oral traditions from which it sprang intentionally recorded the traumatic ideological schism between an integrated ecological worldview and the new, high-entropy model of dominion. The story is not a justification for the new model, but a lament for the old—a critical description of the “fall” into a high-toil, exploitative system. Over time, as this high-entropy material base became dominant, the superstructure reinterpreted this foundational myth, inverting the original critique: the lament (“cursed is the ground... in sorrow shalt thou eat of it”) was redacted and reframed as a divine command (“subdue the earth”) to justify the very system that was originally being mourned. The story of the expulsion from the Garden of Eden is therefore not just a morality tale; it is the foundational myth—and the record of its ideological appropriation—for humanity’s separation from, and subsequent war upon, nature.

1. **Eden as Integrated, Low-Entropy Ecology:** Before the fall, “Adam” exists in a state of perfect integration. The Garden is a low-entropy, steady-state system run on current solar income. There is no concept of “Man” and “Nature”; there is only a single, symbiotic, and cyclical system. Food is provided without toil—that is, without a massive, entropic human energy input—and the human exists within the biophysical flows, not separate from them. This represents the state of many indigenous, deep ecological worldviews (Abram, 1996).
2. **The Knowledge of Separation:** The “fruit” from the Tree of Knowledge is not merely moral awareness. It is the birth of abstract, dualistic consciousness (Plumwood, 1993). It is the moment “Man” becomes self-aware and, in that same instant, perceives the rest of the world as “other.” Nature is no longer what we are but what we are not. This is the birth of the subject-object dichotomy. The natural world is objectified, and the human is set apart. This knowledge is the prerequisite for all future “management” and “exploitation”—concepts that are meaningless without an a priori separation between the manager and the managed.
3. **The Expulsion as a High-Entropy Economic Model:** The “curse” that follows is, in essence, a description of a new economic model based on this separation—a model that is, for the first time, linear and high-entropy:
 - **Toil and Domination:** “Cursed is the ground for thy sake... By the sweat of thy face shalt thou eat bread.” This is the introduction of a new thermodynamic reality. The symbiotic, low-entropy garden is gone. It is replaced by agriculture, a system that requires massive human energy inputs (toil) to fight entropy (weeds, soil degradation) and to impose a simplified, human-centric order on a resistant ecosystem.
 - **Alienation and Linear Throughput:** Adam and Eve are cast out. The cyclical relationship is broken. They are no longer of the garden; they are now exploiters of a fallen world. This creates a permanent psychological state of homelessness (Roszak, 1992)—a yearning for a lost paradise that can only be “rebuilt” by subduing the wilderness, accelerating the entropic throughput² of resources to build a new, human-made “garden” upon it.

This parable codifies the core tenets of an anthropocentric worldview: that humanity is separate from nature; that the natural world is a fallen, resistant object; and that our purpose is to subdue it through high-energy labour, thereby “redeeming” it.

²The shift from a low-entropy, steady-state (Edenic) mode to a high-entropy, linear (agricultural) mode (M_{agri}). This represents the initialisation of a positive entropic throughput variable, \dot{E}_{thru} .

2 The Ideological-Material Feedback Loop

This myth, and the worldview it created, did not just float in abstraction. It became the core dynamic of a powerful, self-reinforcing **Complex Adaptive System (CAS)**—a co-evolving structure that is emergent, non-linear, and adaptive. This system can be understood as operating across three distinct but deeply interconnected **conceptual relational domains**, each subject to different constraints:

The Material Base (M):³ The biophysical and technological “mode of production.” This is the physical domain of **biophysical flows and stocks** (including energy and raw materials) that *technology acts upon*. It is constrained by **real, non-negotiable rules and laws**—not human laws, but the emergent properties of thermodynamics, ecology, and the universe itself. This is the domain where human economic activity intersects with the emergent goals of other organisms and fundamental physical reality.

The Superstructure (S):⁴ The institutional and political domain. This is the realm of the **physically built** and **tangible**; it defines the formal **institutions of society**. These are the political, legal, and state institutions (e.g., property laws, armies, financial systems, cities) that arise to protect, manage, and optimise the Material Base.

The Ideology (I):⁵ The conceptual and cultural domain. This is the realm of the purely **constructive** and **notional**—it is “of the mind.” It comprises the philosophies, religious beliefs, **scientific theories, and technological justifications** that make the system’s operations seem “natural,” “rational,” or “divinely ordained.”

This is not the simple, one-way, deterministic ‘base-superstructure’ model often found in rigid interpretations of Marxism; it is a co-evolutionary feedback loop (Gramsci, 1971).⁶ In fact, Marx’s own work on the ‘metabolic rift’ identified the core material separation this paper explores. His political approach, too, was premised on an emergent, historically contingent ideology—a fact often lost in later interpretations that assumed a predetermined dialectical outcome. The domains are relationally integrated: the Ideology (I) gives “permission” for a new Material Base (M); the “success” of this Base (e.g., MPP-driven growth) then reinforces the Ideology as “correct” and creates a Superstructure (S) (e.g., the Church, the State) to defend them both. The system *adapts*

Consolidating the Worldview: The War on Bioregional Alternatives

This nascent ideological-material feedback loop could not become dominant while competing loops—those that maintained an entropic-aware perspective—still held power. The next crucial step was the superstructural suppression of these alternatives. The persecution of Druidic, animistic, and other indigenous traditions (often labelled “paganism”) was not merely a religious struggle. It was a philosophical cleansing (Hutton, 1991). These traditions were explicitly low-entropy, cyclical, and bioregional.⁷ A bioregion is a geographical area defined by its natural characteristics (climate, ecology, watersheds) rather than by human political boundaries (Sale, 1985). Indigenous cultures co-evolved with their specific bioregions, developing emergent, holistic worldviews that fostered respect, reciprocity, and return—the understanding that what is taken must be given back to the specific land that provided it.

³The biophysical and technological mode of production (M).

⁴The formal political and institutional systems (S).

⁵The justifying worldview or “operating system” (I).

⁶The core feedback dynamic of the model, where $I \leftrightarrow M \leftrightarrow S$, formalised as a set of coupled differential equations.

⁷Represents a competing system with a high value for bioregional feedback (β), which acts to minimise \dot{E}_{thru} and maximise systemic resilience. The “war” is the superstructural suppression of this feedback term.

This bioregional, emergent worldview was a direct threat to the universalist, reductionist ideology of separation. By branding these deep ecological perspectives as heretical and "savage," the emerging dominant superstructure (the Roman Empire, and later the Church) eliminated its primary ideological competitor. This was carried out through literal extirpation—the war on the Druids, the brutal colonisation of indigenous peoples, and the witch trials. These trials, in particular, often targeted women who held traditional, bioregional knowledge of herbal medicine and ecology, representing a superstructural war on a non-mechanistic, ideological alternative (Federici, 2004; Merchant, 1980). This violent erasure cleared the philosophical ground, ensuring that the only "respectable" ideology was one that supported the material base of extraction, one that saw all bioregions as homogenous "frontiers" to be conquered.

3 The Biophysical Engine: Maximum Power as Entropic Accelerator

The ideology of separation (Genesis) and the superstructural removal of bioregional restraints (persecution) were the preconditions. The Maximum Power Principle (MPP)⁸ was the “underlying temptation”—the biophysical engine of the material base that made this high-entropy trajectory seem inevitable.

First proposed in ecology, the MPP suggests that all systems are evolutionarily selected based on their ability to maximise the flow of useful energy (or “power”) through them (Lotka, 1922; Odum, 1971). In simpler terms, the systems that process (dissipate) the most energy, the fastest, out-compete those that process less. This is closely related to the broader Maximum Entropy Production Principle (MEPP), which posits that complex, far-from-equilibrium systems organise to dissipate energy gradients as rapidly as possible (Kleidon & Lorenz, 2005). The MPP can be seen as the “economic” subset of MEPP: it is not just about total dissipation (entropy), but about maximising the useful work (exergy) extracted during that dissipation, which is then reinvested to build and maintain the complex structure of the system itself (e.g., an industrial economy).

This principle frames the “curse” of toil and domination in a new, secular light. It is the evolutionary strategy for maximising entropic throughput.

Ideology as a Weapon: The “Edenic,” bioregional worldview acts as an ethical brake on the MPP. It prioritises stability, resilience, and minimising entropic waste over maximum short-term power.

Separation as an Accelerator: The Genesis-derived worldview removes this brake. By “disenchanted” the world, it reframes nature as a collection of inert resources. This ideological shift unleashes the MPP, reframing it as a virtue. It rewards the system that can accelerate its entropic throughput the fastest.

The Feedback Loop: Once this shift occurred, the MPP provided a relentless incentive. The culture that cleared forests, mined coal (tapping into stored low-entropy from the past), and exploited resources most effectively grew. It developed larger armies and more complex technologies. It inevitably conquered the low-entropy, bioregional cultures that lived within their biophysical limits (Tainter, 1988).

The pursuit of maximum power—maximum energy dissipation—became the de facto morality. Warfare became its most potent expression.⁹ War is the ultimate high-entropy activity, a direct, violent competition in energy dissipation. The society that could channel the most power into its superstructure (its military-industrial complex) won the conflict, thereby selecting for its high-entropy material base and ideology, reinforcing the entire feedback loop.

⁸Formalised as the primary selection pressure (P_{max}), where P_{max} is the rate of useful exergy (\dot{E}_X) captured and processed by the Material Base (M).

⁹The most extreme accelerator of the MPP feedback (W), where state survival becomes a function of maximising $P_{max}(M)$, driving the system (M) to its maximum entropic throughput.

4 The Enlightenment: Formalising the Denial of Entropy

If the Genesis parable provided the myth, the Enlightenment provided the formal *and competing* ideological rationales for a rapidly expanding material base. This period was not a monolithic movement but an intense philosophical battleground—a three-way fork in the road for Western ideology. The current crisis was locked in when one specific, reductionist branch “won” this battle, suppressing the others and installing its entropic-denialist worldview as the sole definition of “reason.”

We can map these three competing traditions:

1. **The “Strong” (Mechanistic/Reductionist) Enlightenment:** This is the tradition (Descartes, Bacon) that the rest of this paper has been tracing. It sought to replace faith-based superstition with a *new* set of absolutes rooted in a mechanistic, reductionist, and mathematical worldview (Horkheimer & Adorno, 1947). This branch is the true secular heir to the Genesis parable of separation. Its core tenets formalised the denial of entropy:
 - **a) The Cartesian Split:** René Descartes’ “I think, therefore I am” established the rational human mind as the sole, certain reality (Descartes, 1637). The entire physical world, animals, and even the human body were “*res extensa*”—a vast, complex, and dead machine. This “animal-as-machine” doctrine gave philosophical permission for industrial-scale exploitation. One does not have a reciprocal relationship with a machine.
 - **b) Reductionism as Method:** The core axiom of the “Strong” Enlightenment was reductionism: the belief that a complex system (an ecosystem, a society) can be understood, predicted, and controlled by breaking it down into its simplest, constituent parts and studying them in isolation (Descartes’ *Discourse on Method*). This was the antithesis of the emergent, holistic understanding of the bioregional worldviews it replaced. This reductionist axiom was essential for creating a “manageable” (i.e., exploitable) world, as it ignores the complex, non-linear emergent properties of the systems being dismantled (like climate stability or soil health).
 - **c) Nature as Clockwork:** This mechanistic, reductionist worldview (Bacon, 1620) could be studied and quantified for manipulation. A “clockwork” universe is the perfect non-entropic metaphor. In theory, a perfect machine runs forever. Its “waste” (dissipated heat, friction) is not a metabolic product, but an “imperfection” to be engineered away or, more simply, ignored. This philosophy creates the concept of externalities.¹⁰
2. **The “Sceptical” (Empirical/Emergent) Enlightenment:** This tradition (David Hume, Adam Smith) represented a profoundly different path. It was not based on *a priori* rationalist design but on *a posteriori* empirical observation and scepticism. This was the true *scientific method*—a critical, observational, and materialist worldview. It saw systems (like economies or societies) as emergent, complex, and historically contingent—the very antithesis of reductionism. This tradition *was* entropic-aware: Smith’s Classical Economics was rooted in the material world of physical labour and biophysical reality (e.g., the Physiocrats), not abstract mathematics. This worldview, which could have led to a critical, thermodynamically-grounded science, was the primary ideological threat to the “Strong” Enlightenment. It was ultimately defeated and purged by the “physics-envy” of the Neo-classical turn, which, as we will see, falsely cloaked the “Strong” Enlightenment’s reductionist ideology in the language of science.

¹⁰The ideological act (I_{deny}) of setting the perceived cost of entropic waste (C_E) to zero within the dominant economic calculation.

3. **The "Romantic" (Counter-Enlightenment):** This tradition (Rousseau, Herder) was a *reaction against* the "Strong" Enlightenment's cold, mechanistic, and universalist logic. It rejected the "clockwork" and instead championed emotion, intuition, and the "organic" or "spiritual" essence of a people (the *Volk*). While it correctly identified the soulless, alienating nature of the reductionist worldview, its "solution" was equally dangerous. By replacing universal reason with essentialist, "natural" hierarchies based on "blood and soil," this tradition provided the ideological seedbed for the ethno-nationalism and Fascism that would emerge later. It was another form of reductionism, just biological and spiritual instead of mathematical.

The 19th and 20th centuries became a battleground where these traditions were operationalised. The "Strong" Enlightenment (Branch 1) provided the "rational" operating system for both Neo-classical Economics and, in a different form, Stalinist central planning. The "Romantic" tradition (Branch 3) directly fuelled the Fascist grand narrative. The "Sceptical" tradition (Branch 2) was the great "road not taken"—its materialist, emergent, and entropic-aware critique was buried, surviving only in fragmented forms (like the critical, scientific method and emergent political theory found in Marx's own work, if not all of his later interpreters).

The "Strong" Enlightenment's victory was total. It successfully reframed its reductionist axioms as "progress" and "rationality," and in doing so, created the justifications for the next stage of entropic acceleration. Its two key justifications, which sealed the fate of the bioregional worldview, were:

1. The Great Hierarchy: Race as a 'Natural' Order: The "Savage" (the African, the Indigenous American) was deemed "closer to nature," ruled by passion, not reason (Gould, 1981). This construction, a direct continuation of the "pagan" persecution, defined low-entropy, bioregional cultures as "primitive" and less than human. This justified chattel slavery (the "animal-as-machine" logic applied to humans) and *terra nullius* (the "empty land" doctrine), as these "savages" were not "using" their bioregions "rationally"—i.e., for maximum entropic throughput via reductionist design (e.g., plantation agriculture).

2. The Anthropocentric Imperative: This framework provided the perfect operating system for a society driven by the MPP.

- The domination of Nature (the "dead machine") was "Progress."
- The domination of "Savage" peoples (the "natural human," part of the machine) was the "Civilising Mission" (Said, 1978).

Both were imperatives to impose a high-entropy, "rational," reductionist order on a "chaotic," low-entropy, cyclical, emergent world. This was the ideology being upgraded to justify a material base that was now global (colonialism) and industrial.

5 Neoclassical Economics: The Operating Manual for Entropic Denial

If the "Strong" Enlightenment provided the philosophy, Neoclassical Economics provided the operating manual. This is the absolute climax of the ideology—the point at which the reductionist worldview and its denial of entropy become a formal, mathematical 'science,' perfectly insulating the material base from critique. This "counter-revolution" was explicitly driven by Scientism: the ideological belief that to be legitimate, economics must emulate the "hard" sciences (Mirowski, 1989). This was not science; it was the application of scientific aesthetics to purge economics of all 'messy', non-reducible variables like history, social power, and, most critically, thermodynamic law.

Neoclassical Economics is not merely influenced by Scientism—it embodies it. At its core, it fundamentally misapplies the principle of equilibrium physics to model what is in reality a non-equilibrium, complex, adaptive dynamical system (the economy). This initial, catastrophic error in framing was deliberate. It is the most complete and dangerous instantiation of a pseudo-scientific ideology designed to legitimise a high-entropy material base under the aesthetic guise of scientific neutrality.

1. **The Rejection of Biophysical Reality:** It emerged as a deliberate reaction against entropic-aware economic theories. It rejected the Physiocrats (Quesnay, 1758), who argued that all true value ("net product") derived from the land/sun (a thermodynamically-grounded view that implies limits). It also rejected the Classical Economists (Smith, Ricardo, Marx), who rooted economics in a material world of physical labour, material class conflict, and moral philosophy (*The Theory of Moral Sentiments*).
2. **The Divorce from "Political Economy" and Physics:** The Neoclassical "Marginal Revolution" (Jevons, 1871; Walras, 1874) was an act of "physics envy" (Mirowski, 1989) that ironically, and deliberately, purged the Second Law of Thermodynamics from its models. It sought to become a "pure science" by severing the economy from its two foundational realities. This act included the appropriation and re-framing of Adam Smith's "Invisible Hand." Smith, a Classical economist, used the term in passing as a social-moral observation on emergent behaviour. The Neoclassicals ripped this from its context and transformed it into a reductionist, mathematical *deus ex machina*: the "proof" that the reductionist, self-interested *homo economicus* (Persky, 1995), operating without any thermodynamic or social grounding, would automatically and always produce the most efficient, stable, and optimal (i.e., non-entropic) equilibrium. It became the ideological guarantee that makes the material perpetual motion machine plausible.
 - **Its Social Reality:** It reduced complex, culturally-embedded human society to the abstract, ahistorical *homo economicus*.
 - **Its Biophysical Reality:** It shifted value from a physical product to a subjective, psychological one ("utility"). Most importantly, as Nicholas Georgescu-Roegen (1971) famously proved, its core reductionist models cannot account for the irreversible, emergent properties of thermodynamic transformation (i.e., low-entropy inputs becoming high-entropy waste).
3. **The Colonial Frontier Model as a Perpetual Motion Machine:** The Neoclassical model is a circular flow. It has no entry point for "Nature" (low-entropy energy/materials) and no exit for "Waste" (high-entropy pollution) (Daly, 1991). It is, quite literally, a mathematical model of a perpetual motion machine—a direct violation of the Second Law of Thermodynamics.¹¹ This was not an oversight. It was a necessary ideological assumption to protect

¹¹The formalisation of ideological entropic denial (I_{deny}), where the model assumes $C_E = 0$ and infinite low-entropy

the material base of the "Colonial Frontier Model" of the world:

- A planet with infinite, costless sources (infinite low-entropy).
- A planet with infinite, costless sinks (infinite high-entropy capacity).

This model is implicitly underwritten by a secular faith in Technological Solutionism: the belief that any future material limit or entropic waste problem (an "externality") will be rendered moot by future human ingenuity (Jevons, 1865, *The Coal Question*), thus making the perpetual motion model plausible.¹²

4. **Financialisation as the Ideology of Dematerialisation:** The final ideological innovation was to take the shift from "physical product" to "psychological utility" and extend it to its logical conclusion: financialisation. This ideology claims that "value" has "dematerialised." It is no longer in *things* (which are finite, dirty, and entropic) but in *abstractions* (information, financial derivatives, brands, and, crucially, Intellectual Property). Intellectual Property (IP) becomes the key superstructural mechanism—the new "enclosure of the commons"—to make this abstract "value" ownable, scarce, and extractable.

This ideology of dematerialisation is the ultimate entropic denial. It presents the "new economy" (tech, finance, media) as "weightless," "clean," and "green," implying it has "decoupled" from the material base (M). This is a fiction. The "dematerialised" economy is parasitic upon a massive, high-entropy material infrastructure (data centres, global shipping, rare earth mining, low-wage manufacturing) that it renders invisible. The business *raison d'être* itself shifts: the goal is no longer to *produce* (a material process) or *service* as a useful public-good, but to *own the IP* (an abstract process) and *manage the financial assets* (an abstract process). This creates a feedback loop where capital flows to the "dematerialised" casino, starving the real material base of the investment needed to manage its growing entropic drag (D_S), thus accelerating the entire system towards a "brittle-fracture" collapse.

This "frontier" was the land inhabited by the "savages." By defining them as part of nature, their resources became "free" low-entropy inputs. This model is fundamentally anti-bioregional: it sees the planet not as a mosaic of unique, finite, and living regions, but as a homogenous, inert stock of "resources" to be extracted from anywhere and shipped everywhere. By "assuming" this "natural order," Neoclassical Economics created the perfect ideological justification for accelerating the material base (MPP). It defined exploitation as "efficiency" and rendered the accelerating entropic degradation of the planet completely invisible to its models. It became the ultimate "Ideological State Apparatus" (Althusser, 1971).

sources ($S_{in} = \infty$). This effectively blinds the Superstructure (S) to all biophysical feedback.

¹²A key function of the dominant Ideology (I_{tech}) that acts to suppress the perceived cost of entropic waste (C_E). It proposes that for any future $C_E > 0$, a technological function (T_n) will emerge such that $C_E(T_n) \rightarrow 0$, thus justifying the continuation of the Material Base (M).

6 The Era of Structural Grand Narratives

These philosophies were operationalised in the 20th century as “Grand Narratives”—totalising, top-down, reductionist ideologies that claimed universal validity. Crucially, these narratives were pitted against each other in a global, MPP-driven competition—total war—which forced the acceleration of entropic throughput as a matter of state survival. While all shared the same entropic-denialist core (stemming from the “Strong” Enlightenment), their differing superstructural and ideological forms acted as different “multipliers” for the entropic drag (D_S) they produced. Their unique inefficiencies—Stalinism’s rigid, wasteful central planning; Neoliberalism’s globally-outsourced, consumer-driven waste; Fascism’s total-war productivism—all represented different methods for maximising the material base at catastrophic, non-linear thermodynamic cost.

- **Neoliberalism:** The narrative of the Market Triumphant (Hayek, 1944; Friedman, 1962), which posits the thermodynamically-impossible Neoclassical model as the only rational, reductionist way to organise society (Harvey, 2005). Its “success” in the Cold War was framed as ideological, but was biophysically a victory of a more effective (and globally-sourced) material base. Its entropic drag multiplier was “efficiently” globalised and outsourced.
- **Stalinism:** A rigid, mechanistic perversion of Marx, this narrative was also anthropocentric and pathologically obsessed with maximising material throughput (the MPP in practice), measuring “success” in tons of steel and megawatts—a “productivist,” reductionist ideology just as blind to entropy as its rival, driven by the existential threat of war. Its drag multiplier was catastrophically high and intensely localised, creating biophysical “sacrifice zones” (like the Aral Sea) through its brute-force, reductionist planning.
- **Nazism (National Socialism):** This narrative rejected both the liberal market and communist class-struggle, replacing them with a pseudo-biological “natural order” of “blood and soil” (drawing from the “Romantic” Counter-Enlightenment). It was the “Strong” Enlightenment’s racial hierarchy taken to its most extreme, mechanistic, and genocidal conclusion. It, too, was a high-entropy, productivist ideology, aimed at maximising the power (MPP) of a “master race” by securing *Lebensraum* (living space)—a euphemism for the total resource-conquest of other nations through war. Its drag multiplier was total, subsuming all biophysical and human systems into its war machine.
- **Socialism with Chinese Characteristics:** A 21st-century hybrid that perfects the high-entropy model. It fuses the totalising superstructural control (S) of Stalinism with a state-directed material base (M) that is arguably the most ruthlessly efficient, MPP-driven, and productivist engine in human history. Its entire ideological legitimacy (I) rests on its success at maximising this material base (M) (i.e., rapid economic growth). This creates a critical ideological distinction from its Neoliberal rival: where the US model must ideologically *deny* the entropic drag (D_S) because its superstructure (S) is (in theory) hands-off, the Chinese model ideologically *admits* the problem (e.g., its pollution, its carbon footprint). It can do this precisely because its superstructure (S) is totalising. Its ideology (I) is not one of denial, but one of *conquest*: it claims its powerful state superstructure (S) will *solve* the entropic drag through massive, top-down Technological Solutionism (I_{tech}) and reductionist engineering, without ever compromising the material base of maximum growth. It is, therefore, the ultimate expression of the ‘Strong Enlightenment’ reductionist hubris, differing from its rivals only in the mechanism of its entropic-denial, not the fact of it.

These seemingly opposed 20th and 21st-century titans—the Liberal Market, the Communist State, the Fascist Nation, and the State-Capitalist Hybrid—were all offshoots of the same “Strong” Enlightenment” ideology (Horkheimer & Adorno, 1947). All were mechanistic, anthropocen-

tric, and reductionist, pathologically obsessed with maximising their material base (the MPP in practice), a process massively accelerated and "justified" by the constant threat of total war. All treated nature as an infinite input and "undesirable" humans as objects to be managed or eliminated for their grand, structural projects.

7 Postmodernism: The Great Retrenchment

The Postmodern turn (Lyotard, 1984) was a necessary and correct reaction to these failed narratives (Foucault, 1971; Derrida, 1976). It correctly identified the profound hubris and violence of the 'Strong Enlightenment's' reductionist worldview—the belief that a single, rational, top-down "Grand Narrative" could be designed and imposed on all of humanity and nature. This critique was championed by the "New Left," a broad movement emerging from the 1960s that, for a time, represented the last great ideological challenge to the entire high-entropy system. This 'Left' was critical of the material base (M) (its productivism, its imperialism, its ecological destruction) and its superstructural enforcer (the military-industrial complex, S).

However, this vital critique was ultimately domesticated by its own "cultural turn," which contained a catastrophic, ironic flaw. Because Neoclassical Economics had so successfully disguised itself as an apolitical, technical "science" (and not an "ideology" or "narrative"), the subsequent postmodern critique gave it a pass.

- **A Critique of Symptoms, Not the Disease:** The critique shifted from the material base (political economy) to the superstructure (discourse, language, culture). It excelled at deconstructing cultural and linguistic power (the ideology). It was, itself, thermodynamically blind. It focussed on the superstructure (text, discourse) while the material, entropic base (the economy) was left unchallenged (Jameson, 1991).
- **The Invisible Engine:** It failed to deconstruct the economic structure, which it mistook for a neutral "reality." It correctly diagnosed the hubris of reductionist design in culture and politics, but missed the master reductionist design of the Neoclassical economy itself.

This failure—this abandonment of the material critique—acted as a "retrenchment," creating a vacuum filled by a resurgent Neoliberalism—an ideology (I) perfectly suited to the new "dematerialised," financialised base (M). The "end of history" was declared (Fukuyama, 1992). The "New Left" critique of the material base (M) was neutered and transformed, eventually calcifying into its modern "Liberal Identitarian" form (Fraser, 1997). This modern "Left" fully accepts the financialised, entropic-denial model as a given; its political energy is focussed entirely on cultural representation within existing corporate and financial structures.

This has found its most potent expression in a modern political pincer movement that traps all meaningful dissent. On one flank, "Extreme Centricism," the superstructural expression of Neoliberal ideology—the political "common sense" that defends this high-entropy, financialised material base (M) as the only "rational" or "pragmatic" path, dismissing all bioregional or emergent alternatives as "unserious" or "utopian." On the other flank, "Liberal Identitarianism" acts as its ideological partner by channelling all critical energy away from the material base (M).

This creates a powerful symbiosis. The "Extreme Centre" superstructure (S) defends the material base (M) while "Liberal Identitarianism" manages the ideological dissent within it. The material, economic engine of entropic extraction (which is now global to feed the "dematerialised" centre) is obscured by a choreographed conflict between its two main defenders. Corporations (the superstructure, S) can adopt the language of this critique (diversity, inclusion) without changing their material operations (extraction, entropy, IP-based monopolies, financial speculation).

This political vacuum also explains the continuing appeal of Fascism. As the material base (M) degrades (due to entropic drag, D_S) and the Centrist superstructure (S) fails to deliver on its promises (Tainter, 1988), sections of the populace become susceptible to another, more brutal reductionist Grand Narrative. Fascism—which, as we've seen, is also a high-entropy, MPP-driven, and "othering" ideology—is presented as the "strong" alternative to the "weak," "corrupt" Centre.

All real, emergent, low-entropy alternatives are thus trapped between three high-entropy, reductionist forces: the Centrist superstructure, its Identitarian ideological flank, and its Fascist brittle-fracture response. All political energy is diverted¹³ while the material, entropic collision becomes inevitable.

¹³A modern ideological feedback (I_{div}) that reinforces the Superstructure (S) by diverting critical energy away from the Material Base (M), allowing \dot{E}_{thru} to accelerate without check.

8 Net Zero: The Structurally Guaranteed Compromise (SGC)

The failure of the postmodern critique—its abandonment of the material base—led directly to a state of **Superstructural Myopia**. This is the inability of the political-economic Complex Adaptive System (CAS) to perceive, model, or implement any solution that threatens its own institutional survival, even if that institutional survival guarantees biophysical collapse. This myopia leads to a process of **Ideological Homeostasis**, where the system self-corrects to maintain its goal-seeking objective: maximising useful energy throughput (MPP).

Within this CAS framework, solutions like “Net Zero” must be understood not as genuine attempts at biophysical contraction, but as **Structurally Guaranteed Compromises (SGCs)**. Their primary function is not to solve the crisis of the Material Base (M), but to manage the dissent within the Superstructure (S), thereby protecting the system’s accrued capital.

- **The Protection of Embedded Exergy (M_K):** A true biophysical solution—one that respects thermodynamic law—would require an immediate and massive write-off of the colossal sunk capital locked into high-entropy infrastructure (*Embedded Exergy*, M_K). Because the Superstructure (S) is designed to resist this high *cost of change* (C_{change}), it cannot enact a solution that involves contraction (degrowth). Instead, the SGC demands a simultaneous decarbonisation and *expansion* of the Material Base (M) to build new green infrastructure (mining, batteries, smart grids), acting as a powerful new accelerator of the entropic throughput (\dot{E}_{thru}). Furthermore, as the system metabolises ever-lower grades of resources to maintain the illusion of growth, the energy required for extraction increases exponentially, leading to **Energetic Divergence** and an explosive increase in systemic depletion (\dot{D}_S).
- **The Ideological Alibi:** The Net Zero target date (usually 2050) is set precisely to allow the Ideology (I) to deploy **Technological Solutionism** (I_{tech}) as the primary alibi. Since technology creation and justification exist in the Ideological domain, I_{tech} provides the license to continue current consumption, promising a future technical ‘fix’. The policy shifts the goal from achieving absolute zero \dot{E}_{thru} to achieving net zero *accounting*. The SGC is therefore not a weak policy; it is the final, potent expression of the system’s entropic denial, actively preventing the emergent solutions required to escape the singularity.

From the perspective of the CAS, any approach that fails to recognise this mechanism—and instead pushes for greater political will within the Net Zero framework—is simply feeding the system’s homeostasis. It is unknowingly aiding the Superstructure in its primary goal of managing dissent, ensuring that the necessary critique is co-opted and neutralised. The necessary political will, therefore, cannot emerge from within the CAS; it must be an ****external, emergent force**** driven by the ****Solidarity of the Scientifically Literate****. This force must reject the SGC outright, uniting on the conviction that scientific integrity demands opposition to any solution that fails to address the Material Base’s non-negotiable thermodynamic constraints. Only when the consensus of experts shifts from endorsing compromised political targets to demanding a root-cause philosophical and material transformation (β , M contraction) does that knowledge become a political force capable of challenging the system’s ****Ideological Homeostasis****.

9 Conclusion: An Ideology Colliding with Reality

This historical trajectory, from an ancient myth of separation to a modern economic “science” that mathematically denies the Second Law of Thermodynamics, has constructed the most powerful ideological system in human history. It has done so by aligning itself with the biophysical incentive of the Maximum Power Principle—an incentive massively accelerated by total war—rewarding the very behaviours that now threaten our collective existence.

This ideology (*I*) has not just shaped our minds; it has physically built a world that reflects it. This creates a system of immense path dependency.¹⁴ Decades of following the MPP-driven, high-entropy material base have locked in a vast quantity of embedded exergy¹⁵ into our global infrastructure—our cities, transport networks, energy grids, financial systems, and agricultural models. This physical lock-in is what severely limits our degrees of freedom. Our entire political and economic superstructure (*S*) is now designed to protect and perpetuate this high-entropy, path-dependent material base (*M*), as any attempt to transition away would mean writing off this colossal sunk cost (Tainter, 1988).

The Resource Entropy Singularity is not, therefore, a merely technical problem. The faith that it can be solved by a “new technology” or a “better carbon market” is Technological Solutionism (Ellul, 1964; Morozov, 2013)—the final ideological expression of the reductionist worldview.¹⁶ It is the belief that a material problem, created by a flawed Material Base (*M*), can be solved by a new material ‘fix’ without ever questioning the Ideology (*I*) that drives the system. Nor can the crisis be “solved” by another top-down, reductionist design, no matter how well-intentioned. Such an approach would be a continuation of the same ‘Strong Enlightenment’ hubris that created the crisis.

A genuine “solution,” if one is possible, can only be emergent. It must arise from a fundamental change in our core ideology (*I*)—a shift away from reductionism, separation, and domination, and towards an embrace of complexity, emergence, and a reciprocal, holistic relationship with the natural world (Capra, 1982; the bioregional worldview, β). The singularity is a philosophical crisis, made manifest in a physical one. It represents the point where a worldview built on the denial of entropy (via finance, tech, and IP) and the erasure of the bioregion—and now physically locked-in by its own embedded exergy—finally collides with the finite, interconnected, emergent, and non-negotiable thermodynamic and biophysical reality it has always denied.

¹⁴The state of the system where the Material Base (*M*) is highly dependent on its past states (M_{t-n}), due to accumulated capital.

¹⁵The physical lock-in of the Material Base (M_K), represented as the total accumulated exergy capital. This capital creates a high “cost of change” (C_{change}), which the Superstructure (*S*) is designed to resist.

¹⁶This refers back to the Ideology of Technological Solutionism (I_{tech}), which serves as the ultimate “get out of jail free card” for the entire reductionist, entropic-denial framework.

Addendum: The Kinetic-Metabolic Decoupling in Economic Theory

Note: This addendum audits the historical divergence between Newtonian natural philosophy and the economic axioms derived from it, specifically regarding the treatment of entropy and system maintenance.

1. Newtonian 'Active Principles' as Maintenance Power (P_{maint})

Contrary to the mechanistic worldview often attributed to him by later Enlightenment thinkers, Isaac Newton did not conceptualise the universe as a closed, self-sustaining mechanical system. In the *Queries* to the *Opticks*, Newton argued that mechanical laws (inertia, impact, gravity) were fundamentally passive. He posited that motion and structure, left to themselves, would succumb to drag and decay.

To resolve this, Newton identified the necessity of 'Active Principles'—forces such as fermentation and cohesion—to 'conserve and recruit' the motion of the universe. In the context of the SETE Model, Newton was effectively identifying the systemic requirement for **Maintenance Power** (P_{maint}). He recognised that any complex system requires a continuous injection of exergy to prevent entropic drag from inducing systemic stasis or collapse.

2. The Kinetic-Metabolic Decoupling

The 'Strong Enlightenment' tradition involved a specific editing of Newtonian physics during its translation into social and economic theory. This process can be understood as an ontological decoupling:

- **Retention of the Kinetic:** Economic theory retained the deterministic equations of motion, modelling the economy as a 'clockwork' mechanism of forces and equilibria.
- **Discarding of the Metabolic:** The 'Active Principles'—the recognition of entropic decay and the requisite exergy inputs for maintenance—were discarded.

By abstracting the 'software' of economic theory from the 'hardware' of the biosphere, this tradition created a paradigm that treated the political economy as a perpetual motion machine. In SETE terms, this effectively set the perceived cost of entropy (C_E) to zero, blinding the superstructure to the accumulation of Entropic Drag (F_{drag}).

3. Selection Strategies: The Moralisation of r-Selection

The resulting synthesis promoted **r-selection**—a biological strategy favouring high growth rates and rapid resource exploitation—as a moral and economic imperative.

- **MPP as r-Strategy:** The Maximum Power Principle (MPP) acts as the engine of r-selection, driving the system to maximise power throughput at the expense of efficiency or longevity.
- **The Suppression of K-Strategy:** By framing rapid throughput as 'Progress', the dominant ideology de-legitimised K-selection strategies (those focused on stability, carrying capacity and maintenance).

4. Dissipative Complexity and Systemic Half-Life

The consequence of this decoupling is a state of **Dissipative Complexity**. This defines a civilisation that achieves high-velocity complexity not through sustainable regeneration, but through

the rapid decay of its own resource base.

A system in this state exhibits high exergy volatility and entropic omission, maintaining the illusion of growth while undergoing a terminal half-life of systemic structural integrity. The **Resource Entropy Singularity** (S_{crit}) marks the point where the r-selected drive for accumulation meets the thermodynamic necessity of K-selected maintenance. The crisis is therefore not merely a failure of policy, but the inevitable reassertion of the metabolic constraints that were theoretically discarded three centuries ago.

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