SY-08 The scale ledger (meta-prompt, run with the library attached)

1. Introduction: The Mathematics of Scalar Stress and the Architecture of Governance

The permanent loss of industrial supply chains and the apparatus of the modern state necessitates a return to first principles in human organization. Historical, ethnographic, and econometric records demonstrate that human governance is not primarily a matter of ideological preference, but a biological, informational, and mathematical problem of scale. The human neocortex imposes hard cognitive limits on information processing and trust verification, meaning that as populations expand, the mechanisms of governance must undergo radical, structural phase shifts to survive. A governance model that produces egalitarian harmony at the scale of a household or hamlet will inevitably collapse into factional violence or authoritarian capture if mechanically extended to a district or a region.

The archaeologist Gregory Johnson (1982) provided the foundational mathematics for this phenomenon, which he termed "scalar stress"[1]. Drawing on information theory, Johnson mapped the thresholds at which horizontally organized, non-hierarchical groups fundamentally fail. When group sizes reach a threshold of roughly six individuals, horizontal decision-making becomes severely strained by the exponential increase in pair relationships and the cognitive limits of tracking reciprocity[2]. By the time a settlement reaches approximately 150 individuals—aligning precisely with Dunbar's cognitive group size limit—the "irritation coefficient" of interpersonal friction mathematically surpasses the group's capacity to resolve disputes through informal mediation[2].

At this 150-person threshold, groups throughout deep time faced a binary evolutionary choice: undergo a fissioning process by splitting into smaller daughter villages, or develop hierarchical institutions capable of mitigating scalar stress[3]. Historically, the initial response in the archaeological record was "sequential hierarchy"—a temporary, situational leadership model wherein hamlet delegates gather to resolve specific crises, only to dissolve back into egalitarianism once the crisis passes[2]. However, as populations cross the critical threshold of 1,500 to 2,500 individuals, sequential hierarchies invariably fail. The informational load demands the emergence of "simultaneous hierarchy"—permanent, vertically stratified bureaucracies operating continuously across multiple scales[4].

Understanding these thresholds is the prerequisite for designing governance systems that resist the inevitable capture by individuals possessing dark-triad traits (narcissism, Machiavellianism, psychopathy). This document systematically evaluates historical self-governance models across an eight-rung scale ledger: household (4 to 10 people), hamlet or band (30 to 50), village (150 to 500), parish or district (1,500 to 5,000), town or watershed (15,000 to 50,000), region or bioregion (0.5 to 5 million), nation or continent (50 to 500 million), and planet (8 billion). By separating stated intentions from historical outcomes and subjecting each to a rigorous

dark-triad capture test, we can isolate the minimum viable principles for governing after the fall.

2. Arrangement Analysis, Scale Ledgers, and Capture Tests

To determine which principles of self-governance hold across time, it is necessary to subject historical models to rigorous examination. Each arrangement must be parsed to separate what its participants claimed it did, what the historical record proves it did, and what modern scholarship infers about its underlying mechanics.

2.1 The Reverse Dominance Hierarchy (The Foraging Band)

The anthropologist Christopher Boehm (1999) theorized that prehistoric human egalitarianism was not a natural absence of dominance, but rather a carefully engineered "reverse dominance hierarchy"[6]. In bands of 30 to 50 individuals, the rank-and-file actively unite to suppress the emergence of alpha males and authoritarian leadership.

Regarding what the participants themselves claimed, oral traditions and ethnographies of foraging groups suggest that these arrangements were viewed as mechanisms to foster spiritual and social equality, ensuring group survival through absolute sharing and communal humility. However, what the historical and anthropological record shows is that egalitarianism was maintained through constant, aggressive, and sometimes lethal vigilance. Ambitious individuals displaying narcissism or dominance were subjected to ridicule, disobedience, exile, and occasionally coordinated assassination by the collective[6]. Modern scholarship infers that this egalitarianism is heavily dependent on dispersed, non-monopolizable resources. When survival requires extreme mobility to track seasonal calories, wealth cannot be accumulated, rendering coercive power nearly impossible to sustain[7].

The strongest case against the reverse dominance model cautions against the "romance of the primitive" and the naturalistic fallacy that "old means good." Critics like Kent Flannery and Joyce Marcus (2012), as well as Manvir Singh and Luke Glowacki (2022), argue that the egalitarian hypothesis is significantly overstated[7]. Ethnographic evidence shows that the recent prehistory of hominoids was filled with diverse social structures. As soon as spatiotemporal resources become concentrated—such as a permanent salmon run or a patch of dense grain—monopolizability occurs, and societies rapidly and violently shift from egalitarian to despotic[7]. Furthermore, hierarchy was never entirely absent in these groups; it was merely displaced upward to supernatural deities and ancestor spirits, and downward to gender and age stratifications within the household[7].

Scale Ledger: The reverse dominance hierarchy operated seamlessly at the household (4 to 10 people) and hamlet/band (30 to 50 people) levels[7]. These scales perfectly match the cognitive capacity for face-to-face surveillance and gossip, which are necessary to sanction dark-triad behavior. At the village rung (150 to 500), the model yielded mixed results, requiring significant ritual, costly signaling, and the constant threat of fissioning to maintain[3]. At the district scale (1,500 to 5,000) and above, the arrangement invariably failed. Anonymity allows dark-triad actors to build private coalitions outside the view of the collective, neutralizing the reverse-dominance dynamic.

Capture Test: A highly Machiavellian individual executes a capture by exploiting a temporary shift in resource distribution, such as controlling a permanent water source or a surplus grain cache. By leveraging this localized monopoly to offer patronage, the dark-triad actor recruits a small, well-fed cadre of loyal enforcers. This fundamentally alters the cost-benefit analysis of the reverse-dominance coalition; it becomes too physically dangerous for the disorganized rank-and-file to attempt an assassination or enforce exile. The only historical feature that reliably resisted this capture was absolute resource dispersion and enforced physical mobility.

2.2 The Piratical Constitution (The Floating Village)

During the Golden Age of Piracy (early 18th century), maritime marauders established highly democratic, constitutional systems to govern ship crews that typically ranged from 80 to 200 men[11]. Economist Peter T. Leeson (2009) mapped how these stateless groups drafted written "Articles" outlining flat pay scales, health insurance protocols, and strict rules of conduct to manage criminal syndicates[11].

The pirates themselves claimed they were operating a "Brotherhood of the Coast," standing as free men against the tyranny of legitimate merchant states and the horrific abuses of royal navies[11]. What the record actually shows is that they were an exceptionally brutal but entirely rational profit-maximizing syndicate. To prevent the captain from preying on the crew and destroying the firm, they radically separated powers. They created the democratically elected role of Quartermaster, who possessed the exclusive authority to allocate provisions, adjudicate interpersonal disputes, and distribute looted treasure[11]. Modern scholarship, particularly Leeson’s work, infers that an "invisible hook" of criminal self-interest drove them to adopt democratic practices, not enlightened morality[11]. By minimizing internal conflict and maximizing cooperation, they reduced the steep costs of maritime predation.

The strongest case against using pirate governance as a broader societal model is that it was a highly parasitic, violently extractive system that relied entirely on the wealth generated by external legitimate economies. It cannot serve as a model for primary production or stable civic life[12].

Scale Ledger: This constitutional arrangement was untested at the household and hamlet levels, as operating a competitive pirate vessel required more labor than those rungs could provide[11]. It worked optimally at the village scale (150 to 500), accommodating average crew sizes of 150 to 200 men who lived in close, highly interdependent quarters[11]. However, at the district level (1,500 to 5,000) and above, it failed catastrophically. Attempts to establish pirate republics on land, such as in Nassau, collapsed rapidly under pressure because horizontal syndicates lack the centralized bureaucracy required to organize the complex logistics necessary for sustained geopolitical defense against nation-states.

Capture Test: A psychopathic or narcissistic captain attempts a capture by leveraging a state of perpetual emergency—such as continuous naval warfare—to indefinitely suspend the Quartermaster's adjudicative authority and rule by martial law. The primary structural feature that resisted this capture was the crew's constitutionally enshrined legal right to depose the captain by popular majority vote at any time outside of direct combat[11]. Furthermore, pirates utilized a "Round Robin" signature system for mutinies, signing their names in a circle so that no

single instigator could be identified and punished by a surviving captain[14].

2.3 The Haudenosaunee Confederacy (The Bioregional Network)

The Iroquois (Haudenosaunee) Confederacy united six historically warring nations under the Great Law of Peace (Gayanesshagowa), formulated between 1570 and 1600 after the Peacemaker and Hiawatha forged an alliance[15].

The participating nations claimed that the Great Law replaced decades of blood feuds and cannibalistic warfare with perpetual peace and a unified mind, overseen by a Great Council of 50 peace chiefs, or Sachems (hodiyahnehsonh)[15]. The historical record shows that it effectively organized a population of tens of thousands across the vast territory of upper New York state and southeastern Canada. It achieved a remarkably sophisticated balance of power by dividing executive representation, held by men, from the authority of appointment, removal, and economic control, which was held strictly by matrilineal Clan Mothers[15]. Modern scholarship infers that the true genius of the Confederacy was its use of cross-cutting cleavages. By nesting clan identities (such as the Turtle or Bear clans) across tribal boundaries, the confederacy structurally prevented strict tribal factionalism. A Mohawk of the Turtle Clan felt deep kinship and solidarity with an Oneida of the Turtle Clan, ensuring that inter-tribal disputes did not automatically escalate into regional wars.

The strongest case against romanticizing the Haudenosaunee model focuses on its external relations. While internally peaceful and remarkably democratic, the Confederacy was ruthlessly expansionist and imperialistic externally, engaging in the devastating Beaver Wars to subjugate or eradicate neighboring tribes to secure economic monopolies over the fur trade.

Scale Ledger: The Haudenosaunee model worked exceptionally well from the hamlet and village rungs all the way up through the district, town, and region/bioregion scales (0.5 to 5 million people)[15]. By nesting political identities, the system effectively scaled to manage a massive geographic territory without requiring a centralized, standing state bureaucracy. It remains untested at the nation or continent level, as its natural evolution was disrupted by the overwhelming, industrialized military power of European colonial states.

Capture Test: A narcissistic warrior with a dark-triad profile attempts to usurp the Great Council's authority by leveraging battlefield prestige and popular adulation to declare himself an unaccountable autocrat. The system actively resisted this capture via the Clan Mothers. Because they controlled agricultural production and held the absolute constitutional authority to strip the title of Sachem from any leader who ceased acting in the collective interest, they could instantly cut off the political legitimacy and economic supply lines of any rogue warlord[15].

2.4 Athenian Assembly and Oligarchic Capture (The Town/Watershed)

The direct democratic institutions of Athens governed 30,000 to 50,000 voting citizens, providing the paramount historical test case for direct assembly governance at the watershed scale. The critical lesson lies in its catastrophic failure in 404 BC following defeat in the Peloponnesian War, when Sparta installed a brutal oligarchy known as the Thirty Tyrants, led by Critias and Theramenes[16].

The Thirty Tyrants claimed they were acting as necessary lawgivers, purging the city of deep-seated corruption, sycophants, and undesirable elements to restore civic order and moral

purity after a devastating war[16]. The historical record shows that in a mere eight months, they executed approximately 1,500 Athenians, utilizing systematic disenfranchisement, property confiscation, and state terror[16]. They specifically targeted "metics" (resident aliens) to violently exploit their wealth and build factional war chests[18]. Modern scholarship, including the work of Josiah Ober, infers that the Thirty utilized "civic division as political technology." They forced the legitimate Boule (council) to sign off on executions, maintaining the appearance of law while destroying its substance[16]. By rewarding a small constituency of included elites, they manufactured a mandate of caution, while using terror to force the excluded majority into prudent silence and withdrawal[16].

The strongest case against Athenian democracy points out that the failure of 404 BC cannot be blamed entirely on Spartan military backing. Critics argue that the susceptibility to elite manipulation, the economic reliance of ordinary citizens on elite patrons, and the erosion of civic norms were pre-existing internal vulnerabilities of the direct democracy that Critias merely weaponized[18]. The erratic, emotion-driven execution of the Athenian generals following the Battle of Arginusae in 406 BC demonstrated how easily the assembly could be whipped into a mob by demagogues, ignoring constitutional legality[19].

Scale Ledger: At the town or watershed rung (15,000 to 50,000), the direct assembly model yielded mixed results. While it functioned conceptually, it was highly susceptible to demagoguery, logistical bottlenecks, and elite capture[16]. At the region or continent scale, the model completely fails, as direct, synchronous assembly does not scale temporally or geographically beyond a localized watershed.

Capture Test: Critias perfectly executed the dark-triad capture. He bypassed horizontal solidarity by rendering ordinary citizens economically dependent, deploying networks of informants, and systematically forcing public judgment to pronounce what power required[16]. By blurring the line between safety and accusation, he made public reasoning feel inherently unsafe[16]. The capture was only reversed through external armed insurrection, when Thrasybulus led exiled democratic forces from the stronghold of Piraeus in 403 BC to overthrow the oligarchs[17].

2.5 The Landsgemeinde (The District to Town)

The Swiss Landsgemeinde is a system of direct, open-air assembly voting that has persisted in cantons like Glarus and Appenzell since the 13th century[20]. Citizens gather physically in a town square to debate and vote on laws by raising their hands or voting cards.

Proponents of the Landsgemeinde claim it embodies the purest form of democratic sovereignty and unmediated civic virtue, where every citizen has an equal voice, fostering deep community cohesion. The historical record shows a more complex reality. It is a highly traditional institution that historically resisted progressive reforms. In 1653, elite patrician capture of rural assemblies, combined with severe economic depression, triggered the Swiss Peasant War[22]. Modern econometric analysis reveals that municipalities operating under the Landsgemeinde vote 3 to 5 percentage points more conservatively on federal referendums compared to immediate neighboring municipalities operating via ballot boxes[20]. Modern scholarship infers that this system possesses a severe structural vulnerability: the physical and temporal transaction costs

of assembly voting artificially suppress turnout. Empirical studies, such as the 2021 survey by Rochat and Kübler (N=2042) in Glarus, reveal that participation rates hover between a dismal 10% and 15%, significantly lower than standard ballot-box voting[23]. Consequently, citizens with tertiary education and flexible schedules are significantly overrepresented, creating a subtle socio-economic elite capture[23].

The strongest case against the Landsgemeinde is that it fundamentally disenfranchises the working class, hourly wage earners, and individuals with intense care obligations who literally cannot afford to stand in a public square for several hours on a Sunday. By romanticizing direct assembly, it replaces the tyranny of a ruling elite with the tyranny of those possessing excess leisure time.

Scale Ledger: The model works well at the village and district scales (1,500 to 5,000), where geographic proximity and lower population numbers allow for meaningful, manageable assembly[20]. At the town rung (15,000 to 50,000), the results are mixed. While Glarus maintains the institution, the logistical constraints drop the participation rate to near 10%, severely straining its democratic legitimacy[23]. Beyond the town level, the model fails entirely due to the absolute physical limits of acoustic space and travel time.

Capture Test: A Machiavellian faction captures the Landsgemeinde by exploiting the open-voting format. Because votes are cast publicly by raising hands, social pressure and the implicit threat of community ostracization are weaponized. Local economic elites or employers can easily monitor how their dependents vote, forcing conformity and effectively silencing dissenters who fear economic or social retaliation.

2.6 Worker Cooperatives: Kibbutzim and Mondragon (The Village to Region)

The Israeli Kibbutz movement (1910s-present) and the Spanish Mondragon Corporation (1956-present) represent two distinct attempts to scale egalitarian principles into the industrial era.

The Kibbutzim claimed to be building a socialist utopia of total equality, operating strictly on the principle of "from each according to his ability, to each according to his need"[25]. Mondragon, founded by Father José María Arizmendiarrieta, claimed a more pragmatic goal: subordinating capital to labor to preserve Basque community resilience[26]. The record shows divergent trajectories. The Kibbutz movement peaked at roughly 122,000 members across 267 settlements but suffered massive demographic stagnation and a crippling collective debt crisis of $5 to $6 billion in 1985[27]. By 1992, the structural ideal collapsed, and over 75% of Kibbutzim privatized, introducing differential salaries based on market value[25]. Conversely, Mondragon successfully scaled from 23 workers in 1956 to 19,500 workers across more than 100 cooperatives by the late 20th century, surviving severe national recessions[26].

Modern scholarship infers that the Kibbutzim failed structurally at scale due to an over-reliance on generational ideological fervor, which naturally decayed, and a dogmatic refusal to adapt their strict equality matrix to the realities of industrial specialization[25]. Mondragon succeeded precisely because it institutionalized robust network governance. It legally capped non-member employment at 10%, created an Inter-cooperative Solidarity Fund to absorb financial shocks,

and strictly separated managerial execution from strategic governance, which remained controlled by the General Assembly on a one-worker, one-vote basis[26].

The strongest case against cooperatives operating within a broader market economy comes from early 20th-century sociologists Beatrice and Sidney Webb, who argued that cooperatives inevitably succumb to "managerial capture." As they scale and face complex market pressures, they are forced to hire outside management experts, eventually transforming into conventional hierarchical firms to survive[26].

Scale Ledger: The Kibbutz ideal worked beautifully at the village scale (150 to 500) but failed at the district scale (1,500 to 5,000) as internal alienation and complex industrial requirements overwhelmed informal egalitarianism[25]. The Mondragon network model successfully operated at the town, watershed, and region scales (15,000 to 5 million), sustained by its supra-cooperative governing bodies[26]. Scaling these models to a planetary level remains untested.

Capture Test: A technocratic elite attempts to capture the cooperative by monopolizing complex operational data and financial ledgers, thereby rendering the democratic General Assembly a blind rubber stamp. Mondragon historically resisted this dark-triad capture by mandating absolute financial transparency, investing heavily in continuous cooperative education, and ensuring the governing council consists purely of elected workers[26].

2.7 Anarchist Collectives (The Region)

During the Spanish Civil War, the syndicalist networks of Aragon (1936-1937) attempted to manage complex industry and agriculture without any centralized state apparatus[34].

The anarchists claimed they had successfully abolished money, class, and the state, achieving true worker liberation while maintaining high agricultural yields through spontaneous communal solidarity. The historical record shows that the system functioned logistically for roughly a year, but was entirely vulnerable to external military hierarchy. In August 1937, the Stalinist general Enrique Líster marched the V Army Corps into Aragon, violently dismantling the Council of Aragon. Líster subjected the collectives to brutal repression, shooting approximately 400 retreating troops and systematically subjugating the decentralized nodes[34]. Modern scholarship infers that purely decentralized, horizontal networks possess a fatal structural vulnerability to concentrated, hierarchical military violence. Because they require consensus, they cannot scale their logistics or self-defense mechanisms rapidly enough to counter a dedicated, top-down state actor[34].

The strongest case against the anarchist collectives notes that they were not entirely voluntary; they relied heavily on wartime terror, coercion, and summary executions to force compliance among the rural peasantry and bourgeoisie, masking their own authoritarianism under the ideological guise of the collective.

Scale Ledger: At the town to region scales (15,000 to 5 million), the model failed. While it briefly managed internal economics, it collapsed violently when subjected to external geopolitical and military stress.

Capture Test: The capture in this scenario is military rather than purely institutional. A highly disciplined, psychopathic faction (exemplified by Líster’s Stalinist forces) simply identifies the decentralized network's inability to coordinate mass military logistics and decapitates the nodes via organized, overwhelming force[35].

2.8 Merchant Leagues and Planetary Commons (The Continent to Planet)

Governance at the largest scales is exemplified by the Hanseatic League of the late medieval period and the modern Antarctic Treaty System (ATS) established in 1959.

Participants claimed the Hansa was a cooperative endeavor to protect merchant privileges and secure safe trade routes; diplomats claim the ATS preserves an entire continent exclusively for peace and science[37]. The record shows the Hansa dominated Baltic trade for centuries but ultimately collapsed in the face of rising sovereign states. The ATS has successfully demilitarized Antarctica for over six decades[38]. Modern scholarship, such as Hendrik Spruyt's analysis, infers that the Hanseatic League failed because a loose league of 160 to 200 independent cities lacked the territorial depth, demographic base, and centralized taxing authority to field standing armies capable of competing with emerging, centralized territorial states[37]. Conversely, scholarship infers the ATS succeeds largely because Antarctica's extreme climate makes resource extraction economically prohibitive; it is a governance of convenience, not a robust system capable of resolving high-stakes scarcity[41].

The strongest case against planetary commons models is that they have never been tested against true resource scarcity. When critical minerals become scarce, rogue actors will inevitably defect, and treaties relying on consensus lack the coercive enforcement mechanisms required to stop them[41].

Scale Ledger: At the nation/continent scale (50 to 500 million), the merchant league is mixed; the Hansa worked economically but failed militarily against states[37]. At the planetary scale (8 billion), the ATS is mixed; it functions only under conditions of extremely low economic friction[38].

Capture Test: A psychopathic state actor defects from the planetary treaty to extract vital resources. Because the commons relies on unanimous consent rather than centralized coercive enforcement, a single defection collapses the entire system, triggering a tragedy of the commons race-to-the-bottom where all other actors must also defect to secure their share.

3. The Scale Ledger: Table of Governance Arrangements

Note: "Documented" denotes historical or empirical evidence; "Inferred" denotes anthropological, sociological, or mathematical projection based on scalar stress models.

Arrangement	Rung (Population Scale)	Status	Reason for Status	Source(s)	Documentation
Reverse Dominance	Household (4-10)	**Worked**	Face-to-face trust strictly limits interperson	[7]	Documented

			al friction.		
	Hamlet/Band (30-50)	**Worked**	Active peer surveillance suppresses alpha emergence.	[6]	Documented
	Village (150-500)	**Mixed**	Reaches Dunbar limit; friction triggers fissioning.	[3]	Documented
	District (1,500+)	**Failed**	Anonymity enables unobserved dark-triad coalition building.	[3]	Inferred
Pirate Constitutions	Hamlet (30-50)	**Untested**	Insufficient labor pool for maritime warfare logistics.	[11]	Inferred
	Village (150-200)	**Worked**	Quartermaster checks captain's power; flat pay scales.	[11]	Documented
	District (1,500+)	**Failed**	Cannot manage complex, sustained land-based geopolitics.	[11]	Documented

Haudenosaunee	Village to District	**Worked**	Clan structures integrate diverse populations horizontally.	[15]	Documented
	Region (0.5m-5m)	**Worked**	Cross-cutting cleavages prevent strict tribal factionalism.	[15]	Documented
	Nation/Continent	**Untested**	Evolution disrupted by external colonial state violence.	[15]	Documented
Athenian Assembly	Town/Watershed (30k-50k)	**Mixed**	Assembly functions but is highly vulnerable to demagogues.	[16]	Documented
	Region and Above	**Failed**	Physical limits of acoustic space and travel time.	[18]	Inferred
Landsgemeinde	District (1,500-5k)	**Worked**	Geographic proximity allows physical assembly.	[20]	Documented

	Town (15k-50k)	**Mixed**	High transaction costs drop turnout to 10-15%.	[23]	Documented
	Region and Above	**Failed**	Impossible logistical transaction costs for participants.	[23]	Inferred
Kibbutz Communes	Village (150-500)	**Worked**	Maintained by intense Zionist/socialist ideological fervor.	[27]	Documented
	District (1,500-5k)	**Failed**	Debt/alienation led to 1992 privatization and collapse.	[25]	Documented
Mondragon Co-ops	Town to Region	**Worked**	Strict separation of strategy (assembly) and management.	[26]	Documented
Anarchist Collectives	Region (0.5m-5m)	**Failed**	Decentralized nodes crushed by hierarchical state militaries.	[34]	Documented

Merchant Leagues	Nation/Continent	**Failed**	City-leagues out-competed by centralized territorial states.	[37]	Documented
ATS (Planetary)	Planet (8 Billion)	**Mixed**	Demilitarized, but untested against severe resource shock.	[38]	Documented

3.1 Scalar Transitions and the Thinnest Evidence

The historical and empirical evidence is robust at the extremes—the foraging band and the territorial nation-state—but becomes exceptionally thin at the **Region/Bioregion (0.5 to 5 million)** rung. This intermediate scale is the historical "valley of death" for self-governance, where models must either centralize into coercive states or risk being conquered by them.

Key Transitions in Governance:

- **Around 150:** The transition from *informal mediation* to *sequential hierarchy*. Face-to-face tracking of reciprocity and reputation mathematically fails. Communities must invent formal constitutional rules or physically fission into smaller groups[3]. The best-attested arrangement here is the Pirate Constitution.
- **Around 1,500:** The transition from *sequential hierarchy* to *simultaneous hierarchy*. Temporary leaders appointed for specific crises are no longer sufficient; the sheer informational load demands a permanent bureaucracy and the delegation of legitimate violence[2]. The best-attested arrangement here is the Haudenosaunee nested clan model.
- **Around 50,000:** The transition from *direct assembly* to *representation*. The absolute physical limits of a town square and the high transaction costs of voting cause direct democracy to collapse into patrician oligarchy[23]. The best-attested arrangement here is the Mondragon federated cooperative model.
- **Around 5 Million:** The transition from *leagues/networks* to *territorial states*. Decentralized alliances lack the centralized taxing authority and logistical cohesion required to survive existential military threats[37].

4. Synthesizing Ostrom's Design Principles for Common-Pool Resources

Governance after the fall cannot rely on the external enforcement of a state apparatus; it must

rely on the self-enforcing management of common-pool resources (CPR). Elinor Ostrom's (1990) eight design principles provide the theoretical and practical framework for this survival. In 2010, Michael Cox, Gwen Arnold, and Sergio Villamayor Tomás conducted a comprehensive, highly rigorous meta-analysis of 91 empirical studies evaluating Ostrom's principles across global settings[43]. They found that the principles are moderately well-supported by the empirical data (yielding an overall average score of 3.73 out of 5 across all 91 studies)[45]. Crucially, the meta-analysis by Cox et al. (2010) established that Ostrom's principles are not standalone panaceas; rather, they are complex configurations. The absence of even a single principle—such as clearly defined social and physical boundaries (Principles 1A and 1B) or the presence of graduated sanctions—can trigger systemic failure and resource depletion[44].
The strongest theoretical critique of Ostrom's principles, as addressed by Cox, is "overspecificity"—the assumption that design rules abstract excessively from local context, history, and culture[43]. However, the meta-analysis mathematically proved that at higher levels of aggregation, the principles represent a sound, predictive basis for successful governance, moving beyond mere descriptive theory into a powerful diagnostic tool for institutional resilience[43].

5. Implementability after the Fall

The loss of the grid, the internet, and state power returns humanity to a low-energy environment where the physical and temporal transaction costs of governance are brutally high.

- **For a Household (4 to 10 people):**
  - *Minimum Viable Model:* **The Reverse Dominance Protocol.** Requires only shared caloric intake and absolute, violent intolerance of hoarding.
  - *Needs to start:* A shared hearth and physical proximity.
  - *First failure to expect:* A charismatic or physically imposing individual manipulates a localized scarcity (e.g., hoarding winter rations) to establish a domestic tyranny.
- **For a Village (300 people):**
  - *Minimum Viable Model:* **The Piratical Constitution.** Because 300 exceeds the Dunbar number, sequential hierarchy is strictly required. This necessitates written, publicly visible rules, a flat distribution of yields, and the absolute separation of the executive (crisis leader) from the adjudicator (quartermaster).
  - *Needs to start:* Literacy, physical records (paper/ledger), a shared calendar, and a central meeting place.
  - *First failure to expect:* **Fissioning.** Because scalar stress is high at 300, factional disputes will cause a significant portion of the village to simply depart, as the cost of leaving into an empty landscape is lower than the cost of submitting to a rival faction[3].
- **For a District (3,000 people):**
  - *Minimum Viable Model:* **The Mondragon Assembly Model.** Direct open-air democracy fails at this scale due to transaction costs. The district must be broken into federated units of no more than 150 people. This requires an overarching assembly of delegates, strict legal limits on non-member labor to prevent exploitation, and mandatory financial transparency.

- *Needs to start:* A secure meeting place for delegates, deep accounting ledgers, and a network of high-trust couriers to transmit data between the 150-person nodes.
- *First failure to expect:* **Managerial capture.** The record-keepers and couriers will leverage their monopoly on complex logistical information to bypass the democratic assembly and slowly form an unaccountable oligarchy[31].

6. Principles

The historical, anthropological, and empirical records rigorously support the following testable principles of governance:

1. **The Fission Principle:** If a horizontally organized community exceeds 150 members without formalizing dispute resolution mechanisms, the irritation coefficient will cause it to fracture into hostile daughter settlements.
2. **The Information Load Principle:** Human communities exceeding 1,500 individuals cannot be governed by sequential, task-based leadership; they mathematically require a simultaneous, permanent hierarchy to manage the informational load.
3. **The Reverse Dominance Principle:** Egalitarianism is not a default state of nature but a high-maintenance structural configuration requiring the constant, unified threat of violence or exile against ambitious individuals.
4. **The Transaction Cost Principle:** As the geographic or temporal cost of participating in a direct assembly increases, participation rates will predictably plummet toward 10%, reliably handing political control to a socio-economic elite possessing excess leisure time.
5. **The Separation of Execution and Adjudication Principle:** To prevent authoritarian capture, the individual authorized to lead in combat or emergency (the Executive) must be structurally and legally blocked from distributing resources and adjudicating internal disputes (the Judiciary/Quartermaster).
6. **The Military Asymmetry Principle:** Geographically decentralized, horizontal governance networks are highly efficient at local resource management but will reliably and violently collapse when confronted by the focused, hierarchical logistics of a centralized actor.
7. **The Monopolization Principle:** The moment a vital resource becomes concentrated in space and time, dark-triad actors will use it to bypass horizontal accountability and establish unbreakable patronage networks.

7. Contested or Open Questions

- Can the "simultaneous hierarchy" mathematically required at the 1,500-person threshold be maintained without the inevitable emergence of an entrenched, hereditary elite?
- To what extent did prehistoric hunter-gatherers genuinely possess "reverse dominance" as a persistent state, versus shifting in and out of hierarchies based strictly on seasonal resource availability, as argued by Flannery and Marcus?
- Can decentralized ledger technologies (if rebuilt locally via low-power mesh networks) permanently lower the transaction costs of assembly voting, or does the physical isolation of the digital voter inherently dissolve the civic solidarity necessary for resilience?
- How can a horizontally governed bioregion defend itself militarily against a hierarchical territorial state without adopting the exact same coercive, top-down structures that destroy

internal self-governance?

8. Summary of Robust Findings

Human governance is strictly constrained by cognitive and mathematical limits; flat egalitarianism breaks down beyond 150 people due to scalar stress and the irritation coefficient. To survive this threshold without fissioning, communities must adopt sequential hierarchies, which must subsequently solidify into permanent, simultaneous bureaucracies as populations cross 1,500. Direct assembly functions conceptually under 5,000 people, but as populations scale to town levels (15,000+), the physical transaction costs of voting severely suppress turnout, enabling subtle oligarchic capture by elites. Highly decentralized models, such as anarchist collectives, excel in equitable resource distribution but are acutely and fatally vulnerable to centralized military decapitation. The most resilient historical mechanisms for resisting dark-triad capture involve aggressively separating executive combat power from resource adjudication (as seen in pirate constitutions) and maintaining multi-layered, nested checks (as seen in Haudenosaunee and Mondragon models). Ultimately, institutional design cannot rely on natural altruism; it must harness rational self-interest through strictly enforced, transparent constitutional rules.

9. Sources to Read in Full

1. **Boehm, Christopher (1999).** *Hierarchy in the Forest: The Evolution of Egalitarian Behavior.* (Essential for understanding reverse dominance and the active, forceful maintenance of equality).
2. **Johnson, Gregory A. (1982).** *Organizational Structure and Scalar Stress.* (The foundational mathematical text on why group sizes trigger necessary hierarchical phase shifts).
3. **Leeson, Peter T. (2009).** *The Invisible Hook: The Hidden Economics of Pirates.* (Demonstrates how rational choice and strict constitutional checks tame highly volatile, dark-triad environments).
4. **Cox, Michael, Arnold, G., & Villamayor Tomás, S. (2010).** *A Review of Design Principles for Community-based Natural Resource Management.* (The definitive meta-analysis of 91 studies validating Ostrom's survival metrics).
5. **Whyte, William F., & Whyte, Kathleen (1991).** *Making Mondragon: The Growth and Dynamics of the Worker Cooperative Complex.* (Crucial for understanding how to scale horizontal ideals to tens of thousands of people without succumbing to managerial capture).
6. **Spruyt, Hendrik (1994).** *The Sovereign State and Its Competitors.* (Explains the fatal military and structural limits of merchant leagues and regional networks when faced with territorial states).
7. **Flannery, Kent, & Marcus, Joyce (2012).** *The Creation of Inequality: How Our Prehistoric Ancestors Set the Stage for Monarchy, Slavery, and Empire.* (The definitive counter-argument to the romance of the primitive, detailing how concentrated resources yield despotism).

Works cited

1. T H E U N I V E R S I T Y O F C H I C A G, https://isac-idb-static.uchicago.edu/multimedia/534/oip128.pdf
2. (PDF) Chapter 1 Early human social organizations and ancient, https://www.researchgate.net/publication/387183036_Chapter_1_Early_human_social_organizations_and_ancient_forms_of_governance_in_Africa
3. Fissioning, Scalar Stress, and Social Evolution in Early Village, https://www.researchgate.net/publication/227795396_Fissioning_Scalar_Stress_and_Social_Evolution_in_Early_Village_Societies
4. theme and variations - Brill, https://brill.com/view/journals/bki/162/2/article-p218_2.pdf
5. Opovo Revisited. Reconstructing Settlement Development and, https://austriaca.at/0xc1aa5572%200x0041e8c2.pdf
6. The Social Evolution of World Politics, https://pub.uni-bielefeld.de/download/2978927/3004182/oa9783839465271.pdf
7. Whither dominance? An enduring evolutionary legacy of primate, https://pmc.ncbi.nlm.nih.gov/articles/PMC10877274/
8. The Three Ages of Government - OAPEN Library, https://library.oapen.org/bitstream/20.500.12657/47505/1/9780472902408.pdf
9. Individuality and Entanglement: The Moral and Material Bases of, https://dokumen.pub/individuality-and-entanglement-the-moral-and-material-bases-of-social-life-9781400883165.html
10. Whither dominance? An enduring evolutionary legacy of primate, https://www.cambridge.org/core/journals/personality-neuroscience/article/whither-dominance-an-enduring-evolutionary-legacy-of-primate-sociality/5BD3B2FA055F4FAEF773B32E750911F2
11. THE INVISIBLE HOOK: THE LAW AND ECONOMICS OF PIRATE, https://www.peterleeson.com/The_Invisible_Hook.pdf
12. The Invisible Hook_ The Hidden Economics o - Peter T. Leeson.pdf, https://syllabus.pirate.care/library/Peter%20T.%20Leeson/The%20Invisible%20Hook_%20The%20Hidden%20Economics%20of%20Pirates%20%28618%29/The%20Invisible%20Hook_%20The%20Hidden%20Economics%20o%20-%20Peter%20T.%20Leeson.pdf
13. Pirational choice - Peter Leeson, https://www.peterleeson.com/pirational_choice.pdf
14. The Invisible Hook: The Law and Economics of Pirate Tolerance, https://www.researchgate.net/publication/228193281_The_Invisible_Hook_The_Law_and_Economics_of_Pirate_Tolerance
15. Native American Influences on American Government, http://resourcesforhistoryteachers.pbworks.com/w/page/126870860/Native%20American%20Influences%20on%20American%20Government
16. Lies and Terror under Athens' Thirty Tyrants - Brewminate, https://brewminate.com/thirty-tyrants-athens-lies-deception/

17. The Peloponnesian War: How Greece Destroyed Itself - Fexingo, https://www.fexingo.com/history/the-peloponnesian-war/
18. Lessons from Athenian Democracy and Modern U.S. Immigration, https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1024&context=nljr
19. part i, https://beckassets.blob.core.windows.net/product/readingsample/356405/9780521548540_excerpt_001.pdf
20. Secret Ballots and Women's Political Voice - Project APE, https://ape.socialcatalystlab.org/papers/apep_0438/v1/paper.pdf
21. Die Stimmbeteiligung an der Glarner Landsgemeinde - LeGes, https://leges.weblaw.ch/legesissues/2018/1/die-stimmbeteiligung_caa45bdd0d.html
22. Swiss Peasant War of 1653 - Historedia, https://www.historedia.com/events/swiss-peasant-war-1653
23. Assembly democracy between social selectivity and equality, https://boris-portal.unibe.ch/bitstreams/829e2073-a414-4dfc-92db-528bac353bde/download
24. Die Beteiligung an der Glarner Landsgemeinde ist tiefer als vermutet, https://www.defacto.expert/2018/05/24/die-beteiligung-an-der-glarner-landsgemeinde-ist-tiefer-als-vermutet/
25. Renewal of the Kibbutz - Rah's Open Lid, https://www.rahs-open-lid.com/wp-content/uploads/2024/01/Russell-Raymond-Robert-Hanneman-and-Shlomo-Getz-The-Renewal-of-the-Kibbutz_-From-Reform-to-Transformation-Rutgers-University-Press-2013.pdf
26. Making Mondragon - United Diversity Library, https://library.uniteddiversity.coop/Cooperatives/Mondragon/Making_Mondragon-the_growth_and_dynamics_of_the_worker_cooperative_complex-1991.pdf
27. Zionist Settlement Policy and Kibbutz Collective Practices, 1920–2010, https://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1177&context=communalsocieties
28. The kibbutz. Awakening from Utopia - Solidaridad Obrera, https://www.solidaridadobrera.org/ateneo_nacho/libros/Daniel%20Gavron%20-%20The%20kibbutz.%20Awakening%20from%20utopia.pdf
29. TRANSFORMING KIBBUTZ RESEARCH - ResearchGate, https://www.researchgate.net/profile/Reuven-Shapira/post/When_do_you_think_leadership_is_important_and_when_is_it_not_so_useful2/attachment/5db867f63843b093838e5dcc/AS%3A819377913991168%401572366326250/download/Transforming+Kibbutz+Research+Book+1.8.2008.pdf
30. Case Study: Innovations in Corporate Governance - SciSpace, https://scispace.com/pdf/case-study-innovations-in-corporate-governance-the-mondragon-36zmw82uju.pdf
31. Co-operative Governance Fit to Build Resilience in the Face of, https://ica.coop/sites/default/files/basic-page-attachments/ica-governance-paper-en-2108946839.pdf

32. Workforce participation : learning from the co-operative sector, http://shura.shu.ac.uk/10104/1/EMES_-_DeNormanville%2C_Wren_and_Ridley-Duff_%28Submission%29.pdf
33. Grounding and Applying an Ethical Test to Organisations as Moral, https://d-nb.info/1271853248/34
34. 1937 in the Spanish Civil War - Wikipedia, https://en.wikipedia.org/wiki/1937_in_the_Spanish_Civil_War
35. Revolutionary Anarchism in Spain - the CNT 1911-1937 (Winter 1981), https://www.marxists.org/history/etol/writers/durgan/1981/xx/cnt.html
36. Enrique Líster - Wikipedia, https://en.wikipedia.org/wiki/Enrique_L%C3%ADster
37. The Economic Origins of the Territorial State, https://www.cambridge.org/core/journals/international-organization/article/economic-origins-of-the-territorial-state/BAFAD6019A07EFA5219B247131839264
38. Assessing the Impact of the World Conservation Strategy After 45, https://www.mdpi.com/2673-7159/6/3/101
39. Governing Outer Space as a Global Commons: Examining 'Tragedy, https://open.uct.ac.za/bitstreams/b28e4429-6aa4-473c-b283-e91982d7f031/download
40. Institutional Selection in International Relations: State Anarchy as, http://www.rochelleterman.com/ir/sites/default/files/Spruyt.pdf
41. 4. What do we mean when we speak about the ... - Semantic Scholar, https://pdfs.semanticscholar.org/0ea3/014fecd17dab31aa5b48637a463987ba43cf.pdf
42. The Kibbutz and Israeli Society in - Berghahn Journals, https://www.berghahnjournals.com/view/journals/israel-studies-review/41/1/isr410103.xml
43. Moving beyond panaceas: a multi-tiered diagnostic approach for, https://www.cambridge.org/core/journals/environmental-conservation/article/moving-beyond-panaceas-a-multitiered-diagnostic-approach-for-socialecological-analysis/F4870A21ED502BB7D9A1784CF2B9E100
44. (PDF) Introducing the "The Importance of Context, Scale, and, https://www.researchgate.net/publication/309540260_Introducing_the_The_Importance_of_Context_Scale_and_Interdependencies_in_Understanding_and_Applying_Ostrom's_Design_Principles_for_Successful_Governance_of_the_Commons
45. Mean and median ranking of the evaluation of the design principles, https://www.researchgate.net/figure/Mean-and-median-ranking-of-the-evaluation-of-the-design-principles-for-each_tbl1_49467004
46. L7 Ostrom Design Principles - Level 7, https://www.level-7.org/Philosophy/Ostrom/