Constraint-Emergence Ontology — Concept Index

The Markov blanket of the document set: every concept the framework introduces, defines, or redefines across the core ontology (`constraint_emergence_ontology.md`) and the Political OS Suite (`political_os/`), with its location, dependencies, and status.

Status Key

Status	Meaning
Axiom	Assumed; rejecting it rejects the framework
Axiom + Empirical	Assumed foundational; has empirical support
Axiom (within OS)	Foundational within a specific Political OS specification
Derived	Follows from axioms and other derived concepts
Derived (with caveat)	Follows from axioms but with acknowledged bias or limitation
Instantiation	Domain-specific instance of a more abstract concept
Conjecture	Testable claim, not yet verified
Interpretive	Compatible with existing science; no independent test
Definitional	Naming convention or terminological clarification
Illustrative	Thought experiment or explanatory device
Empirical finding	Observed pattern in real-world governance data
Meta	About the framework itself, not about reality

I. Foundational Primitives

#	Concept	Definition	Location	Depends On	Status
1	**Constraint**	A condition that determines which transformations are admissible; not a rule dictating what happens next	§0.3	—	Axiom
2	**Constraint network**	The fundamental substrate of reality: a self-consistent, evolving system of allowed and forbidden transitions	§1	1	Axiom
3	**Generative principle**	As soon as a stable configuration is possible within a constraint structure, it will emerge. Emergence is exhaustive, not selective	§0.3	1	Axiom
4	**Unit of change**	The discrete step by which the constraint network evolves; its scale and character are epistemically inaccessible from within emergence	§10.3	2	Axiom
5	**Admissible transformation (morphism)**	A transformation permitted by the constraint	§0.1, §0.2, §0.3	1	Axiom

#	Concept	Definition	Location	Depends On	Status
		structure; what things *do*, not what things *are*			
6	**Structural invariance**	The claim that what persists across substrates is the architecture of admissible change, not the substance undergoing change	§0.1	5	Axiom

II. Core Ontological Concepts

#	Concept	Definition	Location	Depends On	Status
7	**Markov object**	Any stable pattern exhibiting conditional independence of internal dynamics from external dynamics given boundary state; substrate-neutral term for Friston's Markov blanket	§2	1, 2, 3	Axiom + Empirical
8	**Markov blanket (boundary)**	The boundary of a Markov object; screens interior from exterior. Markov object IS a Markov blanket in substrate-neutral vocabulary	§2, §VIII-D	7	Definitional
9	**Constraint manifold**	The full landscape of constraints defining a possibility space; domain-neutral	§0.4, §VIII	1, 2	Derived

#	Concept	Definition	Location	Depends On	Status
		term for the "surface" on which dynamics occur			
10	**Emergent manifold**	A higher-level constraint surface that appears when stable patterns at one level become constraints for the next	§4, §9	7, 9, 11	Derived
11	**Hierarchy of constraint resolution**	Constraints → stable patterns → new constraints → new patterns; the recursive engine of emergence	§4	1, 7, 3	Derived
12	**Emergence as quotienting**	Emergence arises not from adding complexity but from coarse-graining: factoring out irrelevant distinctions to reveal new objects and morphisms	§0.5	5, 10	Derived
13	**Self-bounding hierarchy**	The chain of emergence terminates at a self-consistent base layer that bounds itself	§12	2, 11	Axiom
14	**Deep determinism**	The constraint network evolves deterministically; apparent randomness arises from epistemic inaccessibility of the full constraint state	§13	2, 4	Axiom

#	Concept	Definition	Location	Depends On	Status
15	**Local preorder traversal**	The fundamental operation of all computation: at each point, evaluate the local pre-order on the constraint manifold, move in the preferred direction	§VIII-C	9, 4	Derived
16	**Constraint density**	The concentration of constraint structure per region; drives emergent gravitational effects and determines local update rates	§10	2, 9	Derived

III. Physics Instantiations

#	Concept	Definition	Location	Depends On	Status
17	**Standing wave / eigenmode**	Stable excitation of the constraint network; what we call “particles”	§2	7, 9	Instantiation of 7
18	**Constraint geometry (field)**	A particular sector of the constraint manifold with its own mesh density and topology; what we call “fields”	§3	9	Interpretive
19	**Collapse / constraint locking**	The moment the constraint structure resolves into a single definite configuration;	§6	2, 7	Interpretive

#	Concept	Definition	Location	Depends On	Status
		three components: objective reduction, decoherence, information projection			
20	**Nonlocality / global constraint update**	Entangled systems share constraint structure at the substrate level; no signal travels; the correlation already exists in the geometry	§7	2, 14	Interpretive
21	**Motion / pattern propagation**	Nothing translates through space; the constraint pattern's influence propagates through adjacent network regions; c is the network propagation rate	§8	2, 4, 7	Interpretive
22	**Spacetime emergence**	Spacetime is the geometric projection of the constraint network at large scales; not fundamental	§9	2, 16, 10	Interpretive
23	**Scale-dependent time**	Each emergence layer defines its own timescale: the rate at which patterns on	§9.1	10, 4, 11	Derived

#	Concept	Definition	Location	Depends On	Status
		that constraint plane update			
24	**Gravity as density variation**	Gravity can be described as emerging from constraint density variation; GR's "curvature" and this framework's "density variation" are both descriptions	§10	16, 22	Interpretive
25	**Hilbert space as compression**	Not fundamental; the most efficient mathematical encoding of global constraint dynamics	§5	2, 9	Interpretive
26	**Wavefunction as possibility**	Describes the potentiality structure, not substance; the map, not the territory	§5, §6	25	Interpretive
27	**Constants as emergent invariants**	Physical constants are invariants of stable attractor states of the constraint network, derivable from deeper structure	§11	2, 7, 11	Conjecture
28	**Variable c**	c is constant in the network (one edge per unit of change) but appears	§10.4	4, 16, 21, 22	Interpretive

#	Concept	Definition	Location	Depends On	Status
		variable in coordinate projection where constraint density varies			
29	**Nerf ball model**	Thought experiment: constraints as balls of varying size; reality happens in the gaps between them (absential causation as spatial metaphor)	§10.1.1	16, 18, 34	Illustrative
30	**Higgs as order parameter**	Not fundamental substance; the macroscopic order parameter of a constraint phase that sets stiffness of certain standing-wave modes	§IV	7, 18	Interpretive
31	**Feynman diagrams as topological extrusion**	Propagator lines = information carried along constraint topology; particle identity = topological signature of the channel; vertices = admissibility conditions	§8	21, 18	Interpretive

IV. Observer, Meaning, and Evaluation

#	Concept	Definition	Location	Depends On	Status
32	**Observer as Markov object**	The observer has no special ontological status; it is a Markov object evolved within the manifold through constraint dynamics	§18	7, 10, 11	Derived
33	**Meaning as structural invariant**	Pattern matched against model; the operation is invariant across scales; what changes is the complexity of the constraint space, not the meaning-operation itself	§18	7, 32	Derived
34	**Absential causation**	Constraints and absences are generative: what is *not* present shapes what emerges (Deacon's term, mapped in his section, not adopted as working vocabulary)	§II (Deacon)	1, 3	Derived
35	**Evaluator-as-prompter**	A simpler system provides direction (constraint signal); a more complex system does the constrained traversal. Brainstem→cortex, human→LLM, specification→builder — same architecture	§18	7, 15, 33	Derived
36	**Intent / delta**	The computed difference between current state and target state; the mechanism from which directed action arises	§18	32, 33	Derived
37	**Caring vs meaning**	Meaning = evaluation producing reference	§18	33, 36, 43	Derived

#	Concept	Definition	Location	Depends On	Status
		(any evaluator). Caring = self-maintaining system acting on the delta (life). Distinct emergences on distinct constraint surfaces			

V. Information-Driven Construction Pattern

#	Concept	Definition	Location	Depends On	Status
38	**Encoded representation → constructor → constructed structure**	The universal construction pattern operating across biology, SDLC, politics, LLMs, and neuroscience	§V	1, 7, 11	Derived
39	**Abiogenesis insight**	The constructor precedes the specification in every domain. The encoding emerges as the constructor's solution to reliable replication under constraint. Sequence: constraint → constructor → encoding → encoding drives constructor	§V	38, 3	Derived
40	**Encoded representation (specification / encoding)**	The information that constrains what the constructor produces:	§V	38	Derived

#	Concept	Definition	Location	Depends On	Status
		DNA, requirements, constitutions, prompts, brainstem affect			
41	**Constructor (builder)**	The mechanism that reads the encoding and produces structure: ribosome, LLM agent, governance institutions, cortex	§V	38	Derived
42	**Constructed structure (artifact)**	The output: protein, code, law, evaluation, behaviour	§V	38	Derived
43	**Selection pressure (environment)**	The external constraints that test whether the constructed structure survives: users, regulators, predators, runtime	§V	38, 1	Derived
44	**Feedback / deviation signal**	The environment reporting back to the encoding when the artifact fails; the mechanism by which encodings evolve	§V, §VIII-B	38, 43	Derived
45	**Two compute regimes**	Probabilistic (stochastic expansion, mutation) and	§V	38, 40	Derived

#	Concept	Definition	Location	Depends On	Status
		deterministic (verification contraction, selection). The specification is the fitness landscape			
46	**Living encoding**	Requirements as continuously evolving encoding: defines target, compared against runtime, updated on deviation, drives corrective construction	§V	40, 44	Derived

VI. Emergence Hierarchy (Deacon Alignment)

#	Concept	Definition	Location	Depends On	Status
47	**Dissipative dynamics (homeodynamic)**	Self-organising flow without stable structure; constraint propagation without Markov object formation	§II (Deacon)	1, 2	Derived
48	**Form-producing dynamics (morphodynamic)**	Stable structure emerges directly from constraints; Markov objects form	§II (Deacon)	7, 3, 47	Derived
49	**Self-maintaining dynamics (teleodynamic)**	A Markov object complex enough to	§II (Deacon)	7, 41, 48	Derived

#	Concept	Definition	Location	Depends On	Status
		preserve its own boundary conditions; the constructor, prior to any encoding. Deacon's "autogen"			
50	**Representational dynamics (beyond Deacon)**	The encoding separates from the mechanism; the constructor develops a representation of what it builds. This framework's extension of Deacon's hierarchy	§II (Deacon)	38, 39, 49	Derived

VII. LLM Correspondence

#	Concept	Definition	Location	Depends On	Status
51	**Direction function D(x,c)**	Maps (semantic state, context) to a direction on the manifold; attention implements this; the LLM's constraint propagation rule	§VIII-A	9, 15	Instantiation of 15
52	**Soft unification (interference)**	Weighted similarity matching across key-value pairs; continuous analogue of Prolog's discrete unification; constructive/destructive interference	§VIII-A, Appendix	51	Instantiation
53	**Attractor basin / proto-symbol**	Region in activation space where trajectories converge and remain stable; exhibits Markov blanket boundaries;	§VIII-A, Appendix	7, 51	Instantiation of 7

#	Concept	Definition	Location	Depends On	Status
		how symbolic-like behaviour emerges from continuous computation			
54	**Hallucination as probability degeneracy**	In manifold regions where Markov objects did not form during training, probabilities become degenerate; multiple paths carry equivalent probability; the label belongs to the observer, not the system	§VIII-A	7, 9, 53	Derived
55	**Collapse = sampling**	The model computes a distribution (superposition); sampling collapses it to a specific token (definite outcome); same abstract operation as decoherence	§VIII-A	19, 51	Instantiation of 19
56	**Truth as stable pattern**	Truth is a Markov object: a pattern that persists under perturbation in a constraint manifold	§VIII	7	Derived
57	**Polysemanticity as incomplete screening**	When Markov objects share neurons (superposition), boundaries overlap and external context leaks through; the failure mode when activation space is too low-dimensional	§VIII-D	7, 8, 53	Derived

VIII. Formal Programme

#	Concept	Definition	Location	Depends On	Status
58	**Constraint category C**	Abstract category: objects are (S,	§VIII-D	7, 5, 8	Conjecture (to be axiomatised)

#	Concept	Definition	Location	Depends On	Status
		B, D, σ) tuples; morphisms preserve boundary structure, Markov property, and stability			
59	**Physics functor F_phys**	Maps abstract Markov objects to physical bound states (Hilbert/phase space, potential wells, Hamiltonian evolution)	§VIII-D	58, 17	Conjecture (largely supportable)
60	**LLM functor F_llm**	Maps abstract Markov objects to attractor basins in activation space	§VIII-D	58, 53	Conjecture (testable)
61	**Natural transformation η**	Maps each physical Markov object to its LLM representation, preserving morphism structure; what it means for an LLM to "model" a physical system	§VIII-D	59, 60	Conjecture
62	**Conditional independence conjecture**	For a trained LLM, P(A_I | A_B, A_E) ≈ P(A_I | A_B), with tolerance ε decreasing with model scale	§VIII-D	7, 53, 60	Conjecture (testable now)

#	Concept	Definition	Location	Depends On	Status
63	**Emergence morphism**	Components → composite whose boundary screens internals from exterior	§VIII-D	58, 7	Derived
64	**Collapse morphism**	Superposition → single object, induced by constraint over-determination	§VIII-D	58, 19	Derived

IX. Philosophical and Epistemological Commitments

#	Concept	Definition	Location	Depends On	Status
65	**Laws ≠ Physics**	Mathematical descriptions are maps, not territory; mathematical existence does not confer ontological existence	§0.6 (Phil. Foundation)	—	Axiom
66	**Aristotelian position (potentiality vs actuality)**	Existence requires actualisation; mathematical consistency is necessary but not sufficient for existence	§0.6 (Phil. Foundation)	65	Axiom
67	**Category theory as orientation**	Philosophical stance (morphisms over objects, structure-preservation over identity, quotients over constructions) — not	§0.2	—	Meta

#	Concept	Definition	Location	Depends On	Status
		deployed as formalism			
68	**Philosophy as ontology construction**	Storytelling = constrained manifold traversal that constructs new manifolds for future traversal; all frameworks are stories; the question is productivity	§0.7	9, 15	Meta
69	**Universal computation as ambient space**	The totality of possible processes; this framework asks what is *inhabitable*, not what is possible	§0.4	—	Meta
70	**Recursion barrier**	Gödel, Turing, Cantor are one result: self-referential systems cannot fully characterise themselves from within; resolution is always computation from outside	§15	15	Derived
71	**Edinburgh error**	Confusing "social beliefs shape social reality" with "base reality is also just belief"; the level confusion between social emergent plane and base constraint network	§II (Ladyman & Ross)	10, 65	Derived

#	Concept	Definition	Location	Depends On	Status
72	**Social emergent plane**	At the social level, models running in heads ARE causal forces; beliefs are real constraints on this plane, even though they do not change physics	§II (Ladyman & Ross)	10, 7	Derived

X. Research Agenda Concepts

#	Concept	Definition	Location	Depends On	Status
73	**Proton-electron mass ratio challenge**	Derive the ratio ~1836 from constraint topology as a concrete test of "constants are emergent"	§III (Research Agenda)	27	Conjecture
74	**Hybrid constraint manifolds**	Engineered systems combining probabilistic expansion (LLM generation) with deterministic contraction (verification); recapitulates physics pattern	§VIII	45, 9	Derived
75	**LLMs as constraint manifold laboratories**	LLMs are empirically manipulable constraint systems; most accessible direction for testing the framework	§IX.6	53, 54, 62	Meta

#	Concept	Definition	Location	Depends On	Status
76	**World models as functors**	A world model is a functor from a schema category to the LLM category; alignment is whether η commutes	§VIII-D	61	Conjecture

X-A. SDLC Back-Propagation: Dynamics on Constraint Manifolds

Concepts discovered in the AI SDLC Asset Graph Model (v2.1) instantiation that generalise to the parent ontology.

#	Concept	Definition	Location	Depends On	Status
77	**Cost dynamics on constraint manifolds**	Traversal cost H = T(iteration_cost) + V(constraint_delta) . Constraint density (#16) is the metric: dense constraints = low V = cheap convergence; sparse constraints = high V = expensive convergence = degeneracy. Connects gravity (#24), hallucination (#54), and SDLC failure prediction. Ground state = minimal-effort solution satisfying all constraints. Action minimisation = optimal trajectories converge at minimum total H	§VIII-C.7	15, 16, 54	Derived
78	**Composite trajectory**	Complex Markov objects as composites of sub-objects produced along trajectories through the	§VIII-C.8	38, 7, 11	Derived

#	Concept	Definition	Location	Depends On	Status
		constraint manifold, carrying intent lineage (full causal chain). Not just hierarchical composition (#11) but sequential construction through multiple constraint edges. Each sub-component is a Markov object; the composite preserves history for traceability			
79	**Zoomable constraint structure**	Any transition in a constraint graph expandable into a sub-graph of finer-grained transitions; any sub-graph collapsible into a single edge. Granularity is a choice — the same operations apply at every scale. The hierarchy of constraint resolution (#11) made operational	§VIII-C.8	11, 15, 38	Derived

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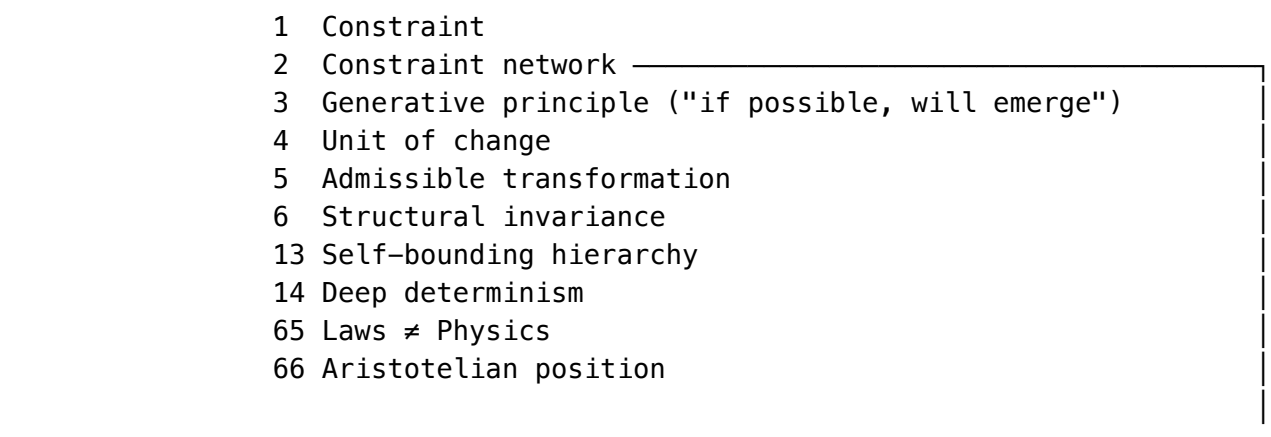
Dependency Graph (Simplified)



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CORE DERIVED
  7  Markov object ◄── 1 + 2 + 3
  8  Markov blanket ◄── 7
  9  Constraint manifold ◄── 1 + 2
  10 Emergent manifold ◄── 7 + 9 + 11
  11 Hierarchy of constraint resolution ◄── 1 + 7 + 3
  12 Emergence as quotienting ◄── 5 + 10
  15 Local preorder traversal ◄── 9 + 4
  16 Constraint density ◄── 2 + 9
  34 Absential causation ◄── 1 + 3

INFORMATION-DRIVEN CONSTRUCTION
  38 Encoding → constructor → structure ◄── 1 + 7 + 11
  39 Abiogenesis insight ◄── 38 + 3
  40–46 Specification, builder, artifact, etc. ◄── 38

OBSERVER & MEANING
  32 Observer as Markov object ◄── 7 + 10
  33 Meaning as invariant ◄── 7 + 32
  35 Evaluator-as-prompter ◄── 7 + 15 + 33
  36 Intent / delta ◄── 32 + 33

EMERGENCE HIERARCHY (Deacon alignment)
  47 Dissipative → 48 Form-producing → 49 Self-maintaining
      → 50 Representational
  Each transition driven by concept 3 (generative principle)

PHYSICS INSTANTIATIONS
  17–31 Standing waves, fields, collapse, gravity, etc. ◄── 7 + 9

LLM INSTANTIATIONS
  51–57 Direction function, attractors, hallucination, etc. ◄── 7 + 9
+ 15

FORMAL PROGRAMME
  58–64 Category C, functors, conjectures ◄── 7 + 5 + 8

SDLC BACK-PROPAGATION
  77 Cost dynamics ◄── 15 + 16 + 54
  78 Composite trajectory ◄── 38 + 7 + 11
  79 Zoomable constraint structure ◄── 11 + 15 + 38

POLITICAL OS SUITE
  80–86  Governance Stack architecture ◄── 7 + 9 + 10 + 11
  87–94  Layer 0 (Hardware / Reality OS) ◄── 1 + 7 + 16
  95–105 Layer 1 (Political OS core) ◄── 38 + 40 + 15
  106–125 OS-specific concepts ◄── 95–105
  126–136 Structural analysis ◄── 95–105
  137–148 Cross-cutting findings ◄── 126–136
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Political OS Suite — Concept Index

Source documents: `political_os/political_operating_system.md` (The Political Operating System), four OS specifications, `us_democratic_political_os.md`, `political_os_test_suite.md`, real-world invariant analysis reports.

XI. Governance Stack Architecture

#	Concept	Definition	Location	Depends On	Status
80	**Governance Stack**	Five-layer model: Hardware → Political OS → Runtime → Programs → Bootstrap. Structural analogue of the constraint hierarchy (concept 11) applied to political governance	POS §Stack	10, 11	Derived
81	**Layer 0: Hardware (Reality OS)**	Physical geography, resources, population, borders — the substrate on which governance software runs	POS §L0	2, 16	Derived
82	**Layer 1: Political OS**	Foundational axioms, invariants, evaluation algorithm — the constraint specification	POS §L1	40, 80	Derived
83	**Layer 2: Runtime (Institutions)**	Courts, legislatures, enforcement, interpretation — the	POS §L2	41, 80	Derived

#	Concept	Definition	Location	Depends On	Status
		constructor that reads the specification and produces governance			
84	**Layer 3: Programs**	Policies, laws, institutional arrangements — the constructed structures operating within the OS	POS §L3	42, 80	Derived
85	**Layer 4: Bootstrap**	Civic education, cultural transmission, OS replication — how the encoding propagates across generations	POS §L4	44, 39, 80	Derived
86	**Logical Encapsulation**	Four-layer architecture (Constraint, Ontology, Algorithm, Operating Principle) for building LLM constraint specifications	POS §Method, ontology_templates.md	40, 35	Derived

XII. Layer 0: Hardware / Reality OS

#	Concept	Definition	Location	Depends On	Status
87	**Polity as Markov object**	A stable governance pattern with constraint-	POS §L0	7, 8	Instantiation of 7

#	Concept	Definition	Location	Depends On	Status
		defined boundaries; its border is its Markov blanket			
88	**Constraint technology**	A technology that extends the reach of coherent administration (agriculture, writing, roads, print, constitutions)	POS §L0	1, 87	Derived
89	**Governance scaling**	Polity size determined by which constraint technologies are available; each technology enables a step-change in administrative reach	POS §L0	88, 87	Derived
90	**Shared legibility**	Common language, civic vocabulary, mutual intelligibility required for the OS to be readable by its users	POS §L0	87, 88	Derived
91	**Authoritarian ground state**	Within a polity, the default absent governance: the strongest actor dominates. The gravitational attractor every Political OS fights against	POS §L0	3, 87	Derived

#	Concept	Definition	Location	Depends On	Status
92	**Inter-state anarchy**	Between polities, the stable ground state: no sovereign above states. Stable when actors are powerful enough that none can impose hierarchy	POS §L0	91	Derived
93	**Asymmetry of construction and destruction**	Distributed governance takes generations to build and a decade to destroy	POS §L0, §L4	91, 85	Derived
94	**Substrate requirements**	Bounded territory, resource base, governable population, shared legibility, institutional infrastructure — what the Hardware layer must provide	POS §L0	81, 87	Derived

XIII. Layer 1: Political OS Core

#	Concept	Definition	Location	Depends On	Status
95	**Political philosophy as constraint specification**	A formal system of axioms, invariants, and evaluation algorithm that determines what counts as legitimate,	POS §L1	40, 82	Derived

#	Concept	Definition	Location	Depends On	Status
		violation, or evidence			
96	**Primary unit**	The irreducible entity each OS treats as foundational: individual (Liberal), class (Marxist), intersectional identity group (CJ), divine order (Theocratic)	POS §L1	7, 95	Instantiation of 7
97	**Pre-order (political)**	The directional gradient each OS defines: Consent > Coercion (Liberal), Emancipation > Exploitation (Marxist), Equity > Domination (CJ), Submission > Autonomy (Theocratic)	POS §L1	15, 95	Instantiation of 15
98	**Invariant (political)**	A constraint that defines the political manifold's topology; performs different operations in each OS: prescriptive (Liberal), analytical (Marxist), hermeneutic (CJ), conformity (Theocratic)	POS §L1	9, 95	Instantiation
99	**Evaluation algorithm**	The procedure by which the	POS §L1, all OS specs	95, 97, 98	Derived

#	Concept	Definition	Location	Depends On	Status
		OS classifies events against its invariants; what makes the specification mechanically operative			
100	**The unit problem**	Why should any particular unit be treated as irreducible? The choice is declared, not argued; each OS defines a different Markov object	POS §Unit Problem	96, 7	Derived
101	**Termination condition**	Can the evaluation algorithm return "stable" or "achieved"? Stable (Liberal), teleological (Marxist), non-terminating (CJ), eschatological (Theocratic)	POS §Structural	99	Derived
102	**OS/Program distinction**	Foundational invariants (OS) vs. policies operating within the OS (Programs); collapsing this distinction is a corruption mechanism	POS §L3	82, 84	Derived
103	**Diagnostic program vs full OS**	Some candidates self-discover as diagnostic programs (analytical tools) rather than complete operating	POS §Structural	95, 101	Derived

#	Concept	Definition	Location	Depends On	Status
		systems (governance-capable); Marxist and CJ are diagnostics			
104	**Host OS requirement**	Diagnostic programs need a host OS for implementation; they cannot answer "who decides" on their own	POS §Structural	103	Derived
105	**State taxonomy**	Classification of polity states (Stable, Strained, Crisis, Authoritarian Dynamics, Systemic Failure); each OS defines its own variant	All OS specs, Reports	95, 98, 99	Derived

XIV. OS-Specific Concepts

Classical Liberal OS

#	Concept	Definition	Location	Depends On	Status
106	**Agency (Invariant 1.1)**	Freedom of choice without coercion	CL OS §Invariants	98	Axiom (within OS)
107	**Information (Invariant 1.2)**	Ability to seek, receive, question information; the replication mechanism of the distributed OS	CL OS §Invariants	98, 85	Axiom (within OS)
108	**Alternatives (Invariant 1.3)**	Real, accessible, non-punitive	CL OS §Invariants	98	Axiom (within OS)

#	Concept	Definition	Location	Depends On	Status
		options must exist			
109	**Revocability (Invariant 1.4)**	Authority removable through peaceful mechanisms; the OS's self-limitation	CL OS §Invariants	98	Axiom (within OS)
110	**Rights as admissible transformations**	Rights are not abstract entities but structural guarantees that certain morphisms remain available (Aristotelian ontology)	CL OS §Rights	5, 98, 66	Derived
111	**Meta-OS**	The Liberal OS as a platform on which other political programs can run accountably; meta-constraints on how constraints may be applied	POS §Cross-cutting	102, 106-109	Derived
112	**Iterative optimisation loop**	Individuals evaluate governance outcomes, explore alternatives, correct course; the Liberal OS does not optimise any single aggregation but protects	CL OS §Eval Algorithm, POS §L2	109, 44	Derived

#	Concept	Definition	Location	Depends On	Status
		the conditions for continuous correction			

Marxist OS

#	Concept	Definition	Location	Depends On	Status
113	**Material Conditions (Invariant 2.1)**	Who owns means of production, who labours, who extracts surplus	Marx OS §Invariants	98	Axiom (within OS)
114	**Class Consciousness (Invariant 2.2)**	Degree to which classes understand their objective interests; emergent from material conditions, not injected	Marx OS §Invariants	98, 3	Axiom (within OS)
115	**Contradiction (Invariant 2.3)**	Internal contradictions in the mode of production that drive historical change	Marx OS §Invariants	98	Axiom (within OS)
116	**Path to Emancipation (Invariant 2.4)**	Whether phenomena advance or obstruct collective emancipation	Marx OS §Invariants	98, 97	Axiom (within OS)
117	**Vanguard problem**	Who governs during and after transition, and by what authority? Acknowledged but structurally unresolved — the governance gap in the spec	POS §Structural	113-116	Derived

Critical Justice OS

#	Concept	Definition	Location	Depends On	Status
118	**Power Asymmetry (Invariant 3.1)**	Group-based hierarchies along identity axes	CJ OS §Invariants	98	Axiom (within OS)
119	**Epistemic Position (Invariant 3.2)**	Whose knowledge is centred or marginalised	CJ OS §Invariants	98	Axiom (within OS)
120	**Structural Reproduction (Invariant 3.3)**	How institutions reproduce asymmetries regardless of intent	CJ OS §Invariants	98	Axiom (within OS)
121	**Transformative Praxis (Invariant 3.4)**	Whether phenomena dismantle or reproduce domination	CJ OS §Invariants	98, 97	Axiom (within OS)

Theocratic OS

#	Concept	Definition	Location	Depends On	Status
122	**Divine Sovereignty (Invariant 4.1)**	All political authority derives from God; no human institution may claim authority independent of or superior to divine will	Theo OS §Invariants	98	Axiom (within OS)

#	Concept	Definition	Location	Depends On	Status
123	**Revealed Truth (Invariant 4.2)**	Divine revelation is the ultimate source of knowledge for governance; human reason operates within bounds set by revelation	Theo OS §Invariants	98	Axiom (within OS)
124	**Sacred Order (Invariant 4.3)**	Society must be structured in conformity with divine design; social roles, hierarchies, laws must reflect the order God has established	Theo OS §Invariants	98	Axiom (within OS)
125	**Faithful Obedience (Invariant 4.4)**	The faithful community must maintain submission to divine authority as expressed through legitimate religious leadership and divinely ordained law	Theo OS §Invariants	98	Axiom (within OS)

XV. Structural Analysis Concepts

#	Concept	Definition	Location	Depends On	Status
126	**Consciousness model**	How each OS maintains the awareness its invariants require: emergent from structure (Liberal), emergent from	POS §Structural	95, 98	Derived

#	Concept	Definition	Location	Depends On	Status
		material conditions (Marxist), cultivated/injected (CJ, Theocratic)			
127	**Interpretive class**	A class required to supply or maintain the OS's consciousness: vanguard (Marxist), DEI administrators (CJ), priesthood (Theocratic). The Liberal OS avoids one by making consciousness emergent	POS §Structural	126, 41	Derived
128	**Provenance chain**	Traceable path from authority source through selection, interpretation, law, enforcement, and back to revocation. Only the Liberal OS closes the loop	POS §L2	83, 109	Derived
129	**Provenance gap**	Points where authority passes through an intermediary that cannot be held accountable; every interpretive class creates one	POS §Structural	128, 127	Derived
130	**Immune maturity**	Resistance of an interpretive class to capture by self-interested actors; theocratic traditions have millennia, CJ has decades	POS §Structural, Theo OS §Immune Maturity	127, 129	Derived
131	**Falsifiability (political)**	Whether the OS can recognise disconfirming	POS §Structural	95, 99	Derived

#	Concept	Definition	Location	Depends On	Status
		evidence. CJ and Theocratic: disagreement is classified as evidence of the thing being critiqued (unfalsifiable by design)			
132	**Symmetry of evaluation**	Whether the same input always gets the same output regardless of actor. Liberal: symmetric. CJ: asymmetric (same action evaluated differently depending on identity position)	POS §Structural	99, 98	Derived
133	**Self-limitation**	Whether the OS constrains its own authority. Revocability (Liberal) is the mechanism; CJ and Theocratic have none	POS §Structural	109, 95	Derived
134	**Program corruption patterns**	Five mechanisms by which programs corrupt the OS: capture, scope expansion, invariant reclassification, indirect degradation, bootstrap corruption	POS §L3	102, 84, 82	Derived
135	**Bootstrap corruption**	A program captures the OS's replication mechanism (Layer 4); the most dangerous corruption because it is self-replicating	POS §L3, §L4	85, 134	Derived

#	Concept	Definition	Location	Depends On	Status
136	**Formally intact but operationally hollow**	The signature pattern of program corruption: OS-level protections exist on paper but have been emptied of operational force	POS §L3	134	Derived

XVI. Cross-Cutting Findings

#	Concept	Definition	Location	Depends On	Status
137	**CJ ≈ Theocratic (structural isomorphism)**	Despite opposite content, CJ and Theocratic OS share: interpretive class, consciousness injection, predetermined conclusions, original condition requiring redemption, questioning as evidence, ongoing ritual of submission, eschatological promise without termination	POS §Cross-cutting	118-121, 122-125, 126-133	Derived
138	**Stack-level determines outcome (control functor)**	Same diagnostic at different stack levels produces opposite outcomes: Marxism-as-program → democratic socialism; Marxism-as-OS → authoritarianism	POS §Cross-cutting	102, 80	Derived
139	**Evolved systems vs diagnostic programs**	Liberal and Theocratic evolved from centuries/millennia of governance practice; Marxist and CJ designed to diagnose failures in existing systems	POS §Cross-cutting	103, 39	Derived
140	**The invasive species**	CJ optimised in academic ecology,	POS §Propagation	131, 135	Derived

#	Concept	Definition	Location	Depends On	Status
	dynamic	propagated into institutional ecology where its natural predators (falsifiability, open debate) do not exist			
141	**Constitutional hardening**	Whether foundational commitments are constitutionally protected or carried only by tradition. Determines whether democratic self-correction succeeds or fails under stress	Reports	98, 87	Empirical finding
142	**Well-formedness criteria**	Seven structural criteria: separated axioms/derivations, testable invariants, termination condition, complete provenance, self-limitation, falsifiability, emergent consciousness. Acknowledged bias toward Enlightenment tradition	POS §Well-formedness	95, 126-133	Derived (with caveat)
143	**Defence in depth (separation stack)**	Multiple structural separations (federal/state, branches, chambers, elected/appointed, government/individual), each independently preventing power consolidation	US Dem OS §Separations	111, 141	Instantiati
144	**Evolutionary bootstrapping**	The Liberal OS cannot be installed by force; it requires generations of distributed practice before formalisation (the abiogenesis insight applied to politics)	POS §L4, US Dem OS	39, 85, 93	Derived
145	**Pre-Evaluation Triage**	Four-step filter before invariant testing: formal encoding →	CL OS §Eval Algorithm	99, 112	Derived

#	Concept	Definition	Location	Depends On	Status
		enforcement asymmetry → runtime distortion → distributional artifact. Prevents both denialism and presumptive encoding			
146	**Built-in Assumptions**	Pre-loaded empirical claims that function as additional axioms within the CJ OS (e.g., Western colonialism as dominant structure, all disparities as structural). Explicitly declared to distinguish them from formal axioms	CJ OS §Built-in Assumptions	95, 118-121	Derived
147	**Identity Paradox**	The CJ OS deconstructs identity categories (Foucault, Butler) while depending on them as stable units for analysis and policy. Strategic essentialism (Spivak) attempts to manage the tension but is operationally dropped	CJ OS §Open Problem 3	96, 118	Derived
148	**Reflexivity Deficit**	The CJ OS claims all knowledge is situated but does not apply this to itself; disagreement is classified as evidence of the thing being critiqued, creating structural unfalsifiability	CJ OS §Open Problem 5	131, 118-121	Derived