

UPA → Axiomatic Ontology

Formal Reconstruction, Validity Audit, Transition Map, AO Foundations v0.1, and the Matter → Life → Mind → Social Research Program

Phases I–IV working report | 13 August 2026

Status: rigorous first-pass reconstruction, not a completed formal proof corpus

Version 1.1 update: typed distinguishability, identity/state distinction, and iron/ferromagnetism stress test added.

Executive conclusion

The UPA corpus already contains much of the architecture that motivated the move to Axiomatic Ontology (AO): Unity is explicitly non-numerical and non-entity-like; polarity is described as mutually determining differentiation; Worlds are relationally organized domains; recursion produces hierarchical differentiation; mappings preserve structure across Worlds; and category-theoretic work already treats identity morphisms, transformations, functors, and involution as formal objects.

The central revision required by AO is therefore not the abandonment of UPA, but a change in logical priority and scope. UPA generally treats polarity as the first differentiation and then builds richer structure from networks of polarity axes. AO should test a more general proposition: distinguishability is prior in logical scope to polarity, with polarity as one structured subtype of distinguishability. This permits UPA's spherical and involutive models to survive as important special models without requiring every distinction, World, or transformation to be polar.

The second major revision concerns theorem status. Several UPA items called theorems are best regarded, at their current level of formalization, as conditional propositions, model theorems, design principles, or empirically testable hypotheses. Their proof sketches frequently rely on substantive assumptions embedded in axioms such as Harmony, Viability, Integration, Generative Agency, and Distributed Agency. AO should preserve these results, but separate deductive entailment from empirical and interpretive claims.

The recommended outcome is not a replacement axiom list yet. AO Foundations v0.1 should begin with a typed formal language and a small set of candidate structural commitments, then use countermodels to determine which concepts are genuinely primitive. The most promising first formal question is whether Identity, Distinguishability, Relation, Transformation, and System/Whole can be specified independently or form a mutually constraining closure.

Scope, sources, and provenance discipline

The OAISQ master page identifies Appendix A (full axioms), Appendix B (derived principles and theorems), geometric realizations, category-theoretic realizations, Semantic Worlds formalization, and separate Axioms and Theorems sections. The current web-accessible corpus also exposes revised individual axioms and theorem pages. This report uses those materials as the historical UPA record and explicitly separates them from hypotheses developed in the present AO session.

Tag	Meaning
UPA-original/revised	Claim or structure recovered from the OAISQ UPA/PMF corpus.
Audit inference	Assessment of formal status or dependency made in this report.
AO-session hypothesis	New conceptual possibility developed in the present discussion.

AO-v0.1 candidate	Proposed formal object for testing; not yet adopted as an AO axiom.
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Important limitation: this document is a rigorous first-pass audit, not a line-by-line machine-checked proof verification of every historical theorem. Some OAISQ material is explicitly marked draft, and the corpus evolved through revisions with occasional numbering/name drift. Accordingly, claims of strict theoremhood are withheld unless the formal entailment is clear.

Phase I — UPA Formal Corpus & Dependency Ledger

I.1 Corpus inventory

The recovered structure is broader than a single axiom list. The master index organizes UPA into foundations, axioms, theorems, philosophy of mind, psychology, applications, geometric/category models, and SGI. The revised preface states that the system grew from structural holism into a framework spanning ontology, consciousness, social systems, governance, and generative agency.

Corpus component	Recovered role	AO relevance
A1 Unity	Pre-differentiated coherence; not numerical oneness; ground of determination, relationality, persistence, integration.	Strong candidate for decomposition: identity/coherence may survive while ontological priority is re-tested.
A2 Polarity	First differentiation; complementary determinations mutually define one another.	Likely special case of structured distinguishability rather than universal differentiation.
A4 World/Correspondence (version drift)	Worldhood and/or cross-layer correspondence appear under A4 in different theorem-era materials.	Requires canonical renumbering before formal proof work.
A5 Harmony	Viability/coherence through proportional regulation.	Potential metric/constraint, not obviously an ontological primitive.
A6 Novelty	Structured generativity and emergence of new distinctions/forms.	Likely transformation/extension principle; empirical interpretation should be separated.
A7 Context	Context-dependent expression/meaning.	Likely parameterization/indexing of Worlds or interpretations.
A8 Integration/Reintegration	Combining differentiated structure into coherent organization.	Candidate operation; must be formally defined.
A9 Mapping	Structured translation between Worlds preserving selected structure.	Naturally formalizable as structure-preserving maps/functors.
A10 Polarity Systems	Networks of interacting polarity axes define differentiated World structure.	Generalize from polarity networks to distinction/relation systems.
A11 Recursion	Recursive differentiation creates hierarchical depth.	Strong survivor, but should not be restricted to polarity refinement.

A12 Multi-Axis Interaction	Multiple axes constrain/modulate one another, producing global structure.	Survives as multi-relational interaction; polarity restriction likely removable.
A15 Viability	Threshold condition repeatedly used by later theorems.	Should be a model-specific predicate/metric unless universally justified.
A17 Generative Agency	Intentional creation of new layers/contexts/Worlds.	Belongs to agency/mind models, not base ontology unless derived.
A18 Distributed Agency	Collective generative agency.	Higher-level application/model extension.

I.2 Canonical conceptual glossary

Term	UPA role	Dependency note
Unity (U)	Non-oppositional ground; not a set member, container, totality, or numerical one.	UPA places it prior to differentiation.
Polarity (σ)	Complementary co-determination $T \leftrightarrow \text{not-}T$; often modeled as an axis/involution.	Depends on differentiation; AO questions whether all D is σ .
World (W_i)	Coherent domain/order in which meaning, identity, relations, and interpretation stabilize.	UPA Worlds depend on Π , context, continuity, harmony.
Polarity System (Π)	Network of σ -axes and dependencies.	UPA architecture of differentiated intelligibility.
Context	Modulates expression/interpretation.	Category appendix suggests indexed/fibrational treatment.
Mapping (Φ_{ij})	Cross-World structured translation.	Naturally a morphism/functor-like construct.
Recursion (R)	Further differentiation and hierarchical depth.	Can generalize to recursive identity/organization.
Harmony (H)	Dynamic proportional viability/coherence.	Requires explicit metric/order if used in proofs.
Novelty (Δ)	Structured emergence of new forms/distinctions.	Needs formal state-space extension semantics.
Identity	Persistence/self-relation across context/layers; explicit in later theorems and category identities.	AO elevates this as a central question.
Transformation	Lawful change/morphism/path.	Already central in categorical and geometric realizations.
Level/Layer	Hierarchical/recursive organization.	Needs canonical distinction between geometric level, semantic layer, and system level.

I.3 Theorem corpus reconstruction

The revised UPA preface explicitly identifies an individual consciousness ladder T8–T12 and a parallel group ladder T8G–T12G. Other recovered theorem material includes T1 Coherence, T3 Recursive Coherence, and T7 Identity Layering. The exact titles and numbering of all intermediate T2–T6 items require canonical reconciliation against Appendix B before a definitive theorem index is published.

Theorem/result	Recovered claim	Initial dependency assessment
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T1 Coherence	Referenced as assuming a unified system of relations.	A1 plus a defined coherence relation/metric; likely conditional/model theorem.
T3 Recursive Coherence	Referenced as requiring unified multi-level architecture.	Depends on recursion plus cross-level coherence definition.
T7 Identity Layering	Coherently mapped identity layers increase harmony/resilience.	Deductive only if 'increase' is built into H/viability axioms; otherwise empirical hypothesis.
T8 Emergent Awareness	First stage of consciousness ladder.	Requires operational definition of awareness; not base-ontology theorem as currently stated.
T9 Reflective Self-Modeling	Recursive self-model stage.	Conditional architecture proposition.
T10 Identity Coherence	Stable identity across contexts/layers.	Promising formal target once identity invariants are defined.
T11 Deliberative Consciousness	Integration of internal multiplicity into deliberation.	Mind/agency model theorem conditional on architecture.
T12 Generative Consciousness	Deliberative self-model plus A17 creates viable new Worlds/layers.	Largely follows by construction from strong premises; interpretation exceeds deduction.
T8G–T12G	Group analogues of consciousness ladder.	Application to multi-agent/group models; not base AO ontology.

I.4 Dependency reconstruction

At a high level the UPA dependency architecture is:

Unity → Differentiation/Polarity → Polarity Systems → Worlds
 ↘ Context / Continuity / Harmony / Novelty / Integration ↗
 Worlds ↔ Mapping ↔ Other Worlds
Polarity Systems/Worlds → Recursion & Multi-Axis Structure → Layers
Layers + Integration + Viability + Agency → Consciousness/Generativity Theorems

The category-theoretic appendix makes a second dependency architecture explicit: objects and morphisms form semantic Worlds; identity morphisms and composition are categorical necessities; polarity is added as an involutive endofunctor σ with $\sigma^2 = \text{id}$; functors map Worlds; natural transformations compare mappings; fibrations/indexed categories model context. This is crucial for AO because category identity and composition do not logically depend on polarity. Polarity is additional structure on a category, which already hints formally that polarity need not be the universal basis of distinguishability or relation.

Phase I checkpoint

Result: UPA is recoverable as a layered formal-philosophical program, but it is not yet one clean formal theory. It contains a base ontological narrative, model-specific geometries, category-theoretic structures, semantic/psychological interpretations, and engineering applications. Version drift and overloaded axiom numbers must be normalized before a machine-checkable theory can be claimed.

Phase II — UPA Formal Validity Audit

II.1 Axiom audit

Issue	Finding	Required correction
Definition vs axiom	Many 'axioms' contain definition, function, interpretation, scaling, failure modes, and normative consequences in one document.	Split each into formal axiom schema + definitions + interpretations.
Strong premises	Harmony/Viability often encode the desirable conclusion used later in theorem proofs.	Avoid circularity by defining measurable H and proving consequences separately.
Domain mixing	Ontology, psychology, ethics, social theory, and SGI implementation are frequently stated together.	Type domains and prevent cross-domain inference without bridge axioms.
Polarity universality	A2 makes polarity the first differentiation; later systems build all complexity from σ .	AO should test countermodels with distinguishability that is non-polar.
World semantics	World is sometimes semantic domain, sometimes layer/context/model.	Give World a formal signature and distinguish World from System, Context, and Level.
Numbering drift	Theorem pages refer to A4 as Correspondence while revised A4 is Worlds; A8 also varies in naming.	Freeze canonical historical versions before proof audit.

II.2 Proof audit — representative results

T7 Identity Layering. The proof sketch moves from unity, correspondence, recursion, harmony, and viability to the claim that added coherent layers increase expected harmony and resilience. The existence of multiple coherent mappings can be formally represented, but the monotonic increase in resilience does not follow from layering alone. A counterexample is a system in which each additional layer adds correlated failure modes or mapping costs. Therefore the current T7 is best classified as a conditional theorem only under an explicit monotonicity/redundancy assumption, and otherwise as an empirical/design hypothesis.

T12 Generative Consciousness. The proof sketch assumes deliberation (T11), a generative agency axiom that explicitly permits creation of new layers (A17), mapping requirements, viability/harmony constraints, and recursion. Under those premises, the existence of viable generated layers is close to definitional entailment. The stronger claims—highest level of consciousness, freedom equals generative capacity, moral development depends on T12, every invention is world-creation—are interpretations or hypotheses, not deductions.

Category-theoretic polarity. If σ is defined as an involutive endofunctor, $\sigma^2 = \text{id}$ is a formal property by definition, and functorial preservation of composition is a theorem/requirement of functor structure. These are genuine formal results within the categorical model. They do not prove that ontological polarity in Reality is involutive; they prove consequences of that realization.

II.3 Countermodel tests

Claim under test	Countermodel	Audit result
Every distinction is polar	A category/set with three unrelated distinguishable objects a,b,c and no complement involution.	Distinguishability does not entail polarity.
More identity layers increase resilience	Layers share one common dependency; failure of that dependency collapses all layers.	Needs independence/redundancy assumptions.
A World requires polarity	A relational category/graph with identities and transformations but no involutive complement.	UPA-World definition requires σ ; generalized AO-World need not.
Recursion requires polarity	A recursively defined tree, grammar, or category hierarchy without binary complements.	Recursion generalizes beyond σ .
Mapping requires polarity preservation	A structure-preserving map between non-polar relational systems.	Mapping is more general than σ -preserving mapping.
Whole/system requires bounded totality	An open dynamical/network system with stable local identity but changing membership.	System identity need not imply final ontological border.

II.4 Formal reclassification

UPA item class	Recommended AO-era status
Pure mathematical consequences of chosen geometry/category structure	Theorem/lemma within named model.
Statements that restate an axiom in derived vocabulary	Corollary by construction or definition, not independent theorem.
Claims of increased harmony/resilience/psychological outcome	Conditional theorem if metric assumptions are formalized; otherwise empirical hypothesis.
Claims about consciousness stages	Architecture/model propositions requiring operational consciousness definitions.
Claims about moral, spiritual, social, or clinical meaning	Interpretation/application, not theorem.
Cross-domain analogies	Correspondence hypotheses; require explicit bridge mappings.

Phase II checkpoint

Result: UPA contains real formalizable mathematics, especially in its geometric and category-theoretic realizations, but its published theorem vocabulary is broader than strict mathematical theoremhood. AO should preserve the content while enforcing a sharper proof discipline: premises, domain, formal language, derivation, countermodel, and interpretation must be separated.

Phase III — UPA → AO Transition Map

III.1 Conceptual mapping

UPA construct	AO disposition	Reason
Unity	GENERALIZE / OPEN	Retain coherence/non-separation insight; test whether Identity, coherence, or common domain replaces ontological priority.
1 as Unity	REVISE	AO-session hypothesis: 1 may represent identity/identity operation rather than a primordial bounded One.
Polarity	SPECIALIZE	Retain as important structured/ involutive distinction; do not equate with all distinguishability.
Distinguishability	ELEVATE	Introduce as broader relation/property $D(a,b W,L, \text{possibly context})$.
Sphere S^2 / S^n	SPECIALIZE	Excellent worked realization and pedagogical entry point, not universal ontology.
World	GENERALIZE	From polarity-generated semantic order to axiomatically constrained domain of identities, distinctions, relations, transformations.
System/Whole	GENERALIZE	Candidate: organized structure that supports an identity under specified invariants; need not be final/bounded totality.
Level/Layer	GENERALIZE	Recursive re-identification/ composition scale; distinguish from mere hierarchy.
Recursion	RETAIN + GENERALIZE	Not restricted to sub-polarities; applies to distinctions, systems, mappings, representations.
Mapping	RETAIN + GENERALIZE	Structure-preserving relation between Worlds; σ -preservation optional by model.
Context	RETAIN	Index/parameter affecting interpretation and allowed morphisms; categorical fibration work is promising.
Harmony	SPECIALIZE	Useful viability metric in particular biological/psychological/engineering models; not assumed universal ontology.

Novelty/Generativity	OPEN	May describe expansion of state/structure space, but should not yet name the unknown '?'.
P / ~P	OPEN / DECOMPOSE	Do not assume ~P has one substance or singular nature; treat candidate types separately.
God correspondence	DEFER	Phase V comparative interpretation after AO core stabilizes.

III.2 Generalization tests

The strongest formal clue comes from the category-theoretic realization. A category already has objects, morphisms, identity morphisms, and composition before an involutive polarity functor is added. Therefore an AO World can plausibly be modeled first as a structured domain with identity and lawful transformation, with polarity represented as optional additional structure. This reverses the UPA dependency order without discarding the UPA categorical machinery.

Similarly, the spherical realization can be reframed as AO Model SP: a World with antipodal/involutive distinction on S^n , geodesic transformations, and selected invariants. Theorems proven there remain valid in Model SP even if AO admits graph, categorical, topological, dynamical, or other Worlds.

III.3 Cross-domain stress tests

Domain	What it stresses	AO implication
Electromagnetism	Clear positive/negative structures and field relations.	Polarity remains a strong special model.
Strong interaction	Multi-valued constrained structure and composite identities.	Distinguishability/relations cannot be reduced to binary opposition.
Weak interaction	Lawful transformation changes particle properties.	Identity must be invariant-relative, not simple property equality.
Gravitation	Geometry and physical content are mutually constraining in GR.	World/context and contents may not always be independently specified.
Quantum theory	States, symmetries, transformations, measurement contexts resist classical isolated-object ontology.	AO must avoid assuming classical intrinsic identity.
Language	Meaning depends on relational/contextual/compositional structure; whole constrains part interpretation.	Strong non-physical/formal test domain for World, Context, Mapping, Level.
Smutsian holism	Wholes acquire properties/identity not exhausted by aggregation.	System/Level may formalize whole-making, but AO must not assume final totality.
Open systems	Stable identity can coexist with changing membership/boundaries.	Identity does not require an absolute ontological border.

III.3a Worked stress test: chemical elements, iron, and emergent polarity

Chemical elements provide a useful physical analogy for a structured domain of distinguishable identities. Elemental identity is not ordinarily polar: Fe is distinguishable from Co, Ni, O, and other elements without any of those identities being its opposite. Iron then exposes further kinds or bases of distinction within a continuing identity: electronic and magnetic states, relational and orientational distinctions, collective domain organization, and macroscopic magnetization.

Ferromagnetic iron is especially instructive because recognizable macroscopic magnetic polarity is not simply identical to elemental identity. Microscopic magnetic moments and exchange interactions permit collective ordering; magnetic domains can organize so that bulk magnetization cancels or becomes nonzero. Thus polarity can be generated at a higher Level from distinguishable states, interactions, and organization, and once present it constrains subsequent relations and transformations of the System.

AO consequence: the single predicate $D(x,y)$ is probably too coarse. AO should test typed or indexed distinguishability, provisionally $D^k_{\{W,L,C\}}(x,y)$, where k identifies the basis of distinction and W, L , and C identify World, Level, and Context. Candidate bases include identity, state, relational, orientational, and organizational distinction; these categories remain provisional and should be refined by counterexamples.

A second consequence is the distinction between distinguishability of identity and distinguishability within identity. A System may occupy distinguishably different states while satisfying the same identity criterion. This is essential to Transformation: lawful change must be able to alter state without necessarily destroying identity. Conversely, some transformations may cross the relevant identity criterion and yield a newly identified System.

The iron case therefore suggests a revised structural possibility: distinguishable identities/states + relations + transformations + organization can yield a higher-Level property such as polarity; that emergent property can then become

formative by constraining higher-Level relations and transformations. This is a stress-test result, not an assertion that all emergent properties or all polarity arise in this way.

III.4 Transition classification

The transition can be stated compactly:

UPA: Unity → Polarity → polarity systems → Worlds → recursion/integration/generativity

**AO hypothesis: Identity / Distinguishability / Relation / Transformation / Organization
are mutually constraining structural roles; polarity and spheres are special realizations.**

This is not yet an AO theorem. It is the result of the transition audit and defines the questions Phase IV must formalize.

Phase III checkpoint

Result: UPA survives most naturally as the first rich family of AO models rather than as the universal ontology itself. The conceptual gain is scope: AO can retain every successful polar/spherical theorem while admitting non-polar distinctions, non-spherical Worlds, heterogeneous ~P candidates, and open-ended Levels.

Phase III.5 — Methodological consequence: adopt the inductive reconstruction program

The Phase III stress tests change the role of AO Foundations. AO should not attempt to complete its primitive ontology primarily through abstract reflection. Instead, it should use its provisional formal language as an investigative apparatus for reconstructing domains of established knowledge. The explicit method is axiomatic systems, reconstruction, and modeling; mathematical form is implicit in those practices.

The research direction is adapted from Smuts's inductive movement through matter, life, and mind, but AO does not presuppose Holism as the common answer. Social organization is added as a further major domain. At each stage the same questions are asked: Which categories remain structurally invariant? Which persist only after reformulation? Which fail? Which genuinely new categories are required?

The sequence Matter $\rightarrow$ Life $\rightarrow$ Mind $\rightarrow$ Social Organization is therefore an order of inquiry, not an axiom of reduction, emergence, causation, or ontological priority. Cross-Level similarity of vocabulary — field, structure, regulation, information, whole, interaction — is insufficient. A common category is recognized only when a model or mapping establishes the relevant preservation.

Phase IV — AO Foundations v0.1

AO v0.1 is deliberately a candidate formal language, not a final axiom set. Its purpose is to create the smallest structure in which the questions exposed by Phases I–III can be proved or refuted.

IV.1 Candidate formal signature

Symbol/type	Provisional meaning
W	World/model: an axiomatically constrained domain.
$Ob(W)$	Identifiable objects/states/systems admitted by W .
id_x	Identity morphism/self-map for x where the model supports categorical structure.
$D_{W,L}(x,y)$	x and y are distinguishable in World W at Level L .
$R_W(x,y)$	An admissible relation between x and y .
$T: x \rightarrow y$	A lawful transformation/morphism.
$Inv_T(x)$	Set/predicate of invariants relevant to identity under T .
$S = Org(\{x_i\}, R, T, \dots)$	Organized system formed from components and relations.
L	Level/index of organization or description; semantics to be formalized.
σ	Optional polarity operator; in involutive models $\sigma^2 = id$.
C	Context/index affecting admissible interpretations/relations.
$F: W_i \rightarrow W_j$	Structure-preserving mapping between Worlds; preservation profile must be declared.

IV.1a Refinement prompted by the iron stress test

Replace the unqualified working use of D with a typed/indexed form when needed: $D^k_{W,L,C}(x,y)$. The superscript k denotes the basis of distinction, while W , L , and C locate the distinction within a World, Level, and Context. AO v0.1 does not assume a final taxonomy of k .

Introduce a state relation $\text{State}(x,s)$ and an identity criterion $\text{Id}_K(x)$, where K denotes the invariants or criteria relevant to the inquiry. AO must permit $\text{State}(x,s1) \neq \text{State}(x,s2)$ while Id_K remains preserved. This separates change of state from change of identity.

Treat polarity as potentially relational and/or systemic. $P(x,y)$ can denote a polar relation between distinguishable relata in a polar model, while $P(S)$ can denote polarity acquired by an organized System. The latter permits emergent polarity without making polarity the primitive source of all distinction.

IV.2 Candidate axioms/schemas for testing

AO-C1 — Identity law (logical/categorical minimum). For every admitted object x , $x = x$; in categorical models an identity morphism id_x exists and composes neutrally. This does not assert a metaphysical primordial One.

AO-C2 — Distinguishability is typed/relative. $D(x,y)$ is evaluated within a specified World and, where needed, Level/context. AO does not initially assert that every pair is distinguishable or that distinguishability is intrinsic.

AO-C3 — Relations require relata. If $R(x,y)$ is admitted, x and y must be admitted identities in the relevant World. The converse is not assumed.

AO-C4 — Transformations have domain/codomain and declared identity criteria. Whether x and $T(x)$ count as the same System depends on specified invariants, not on universal property equality.

AO-C5 — Polarity is additional structure. A polar model supplies σ or an equivalent complement relation satisfying model-specific constraints (possibly involution). AO does not assert that every D pair belongs to σ .

AO-C6 — Composition/organization may support new identity. Under model-specific organization and persistence conditions, a structured collection may be admitted as a System S and itself enter relations/transformations. The conditions are not yet universalized.

AO-C7 — Mappings declare preservation. A mapping F between Worlds must specify which structures it preserves or reflects (identity, D , R , T , σ , invariants, context). There is no assumption that all mappings preserve all structure.

AO-C8 — No final-border axiom. AO makes no base assertion that the totality of Reality is bounded, finite, complete, or representable from an external viewpoint.

AO-C4a - State change under preserved identity. There may exist $s1 \neq s2$ and a transformation T such that T maps a System from state $s1$ to $s2$ while preserving the identity criterion K . Therefore distinguishable state does not entail distinct System identity.

AO-C6a - Emergent property schema. If an organized System S satisfies model-specific relations, interactions, and organization conditions, S may possess a property Q not assigned in the same sense to its isolated constituents. AO does not assume Q is universal, irreducible, or uniquely holistic.

AO-C6b - Formative higher-Level constraint. If Q is a property of S admitted at Level $L+1$, Q may enter the conditions governing admissible relations and transformations of S at that Level. This makes an emergent property potentially formative without identifying it with the unresolved generative question mark.

IV.3 First lemmas and counterresults

Lemma 0.1 (Model-relative polarity). In any AO model with a defined involution σ satisfying $\sigma^2 = \text{id}$, polarity is symmetric under repeated application: $\sigma(\sigma(x)) = x$. This is a theorem of the polar model, not of AO generally.

Counterresult 0.1 (Distinguishability does not imply polarity). There exists an AO-compatible relational model with distinguishable objects and no complement/involution. Therefore $D(x,y)$ does not entail $\text{Polar}(x,y)$ without an additional axiom.

Counterresult 0.2 (Identity does not imply boundedness). There exist open systems with a specified persistence criterion and changing membership. Therefore admission of system identity does not by itself entail a fixed outer boundary.

Counterresult 0.3 (Recursion does not imply polarity). Recursive structures can be constructed over non-polar distinctions. Therefore recursion is formally more general than recursive polarity.

Lemma candidate 0.2 (Structure-preserving identity). If $F:W_i \rightarrow W_j$ is a functor, then $F(id_x)=id_{F(x)}$. This is a standard categorical consequence and supplies an exact AO example of identity preserved under World mapping when Worlds are categories.

Theorem candidate 0.3 (System re-identification across Level). If a model defines organization predicate Org, persistence invariant P, and closure conditions sufficient for S to be admitted as an object at L+1, then S possesses an identity morphism at L+1 and may participate in relations and transformations there. At present this is a theorem schema because the sufficient conditions for Org/P remain to be specified.

Counterresult 0.4 (State distinguishability does not entail identity distinction). A model can contain one System with two distinguishable states connected by an identity-preserving transformation. Therefore $D_{state}(x_{s1},x_{s2})$ does not entail distinct identity under criterion K.

Theorem schema candidate 0.4 (Emergent-to-formative transition). Given explicit organization conditions O, an emergent property Q of S at L+1, and rules making Q a parameter of admissible relations or transformations at L+1, Q constrains the subsequent state-transition space of S. The content becomes nontrivial only when O, Q, and the transition rules are independently specified rather than defined to force the conclusion.

IV.4 The Axiomatic Holism question

The current work does not justify 'Axiomatic Holism' as the formal name of the theory, but it produces a precise research hypothesis:

Axiomatic Holism Hypothesis (AHH): No adequate AO account of Identity, Distinguishability, Relation, Transformation, and organized Systemhood can specify all of these independently; their admissible meanings are mutually constrained by the structure of the World in which they occur.

AHH should not be adopted as an axiom. The next formal program should attempt to falsify it by constructing models in which one or more of these notions are independent. If independence repeatedly fails under minimal adequacy conditions, a genuine holism theorem may become possible.

IV.5 What remains intentionally unnamed

AO v0.1 does not assign a formal object to the session's '?'. The audit shows several distinct candidates that UPA sometimes bundled under Unity, polarity, novelty, recursion, integration, or generative agency. The correct discipline is to leave the placeholder unresolved until the formal system shows a missing operator, relation, closure condition, or family of structures.

Likewise, $\sim P$ is not axiomatized as one substance. Candidate non-physical/formal kinds—meaning, mathematical relation, logical structure, representation, normativity, experience, organization—should be typed separately and only unified if a theorem or successful abstraction warrants it.

Phase IV checkpoint

Result: AO Foundations v0.1 is sufficient to begin formal experiments but not to declare a completed ontology. The immediate mathematical work is now clear: define World, System, Level, identity criteria, and distinguishability precisely; construct polar and non-polar models; prove preservation results under mappings; and test whether the Axiomatic Holism Hypothesis survives countermodels.

Phase V — Inductive Domain Reconstruction and Cross-Level Synthesis

Phase V becomes the next major substantive research program. It is intentionally multi-stage and open-ended. Its purpose is to reconstruct what contemporary knowledge requires us to mean by the fundamental categories of matter, life, mind, and social organization, and then determine what, if anything, is formally common across them.

V.1 Matter Reconstruction

Begin with matter as contemporary physics and chemistry understand it, not with a classical model of inert substance. Investigate quantum states and fields, the strong, weak, electromagnetic, and gravitational interactions, symmetry and symmetry breaking, conservation and invariance, spacetime, particles, atoms, chemistry, condensed matter, and organized physical systems. For each, record identity criteria, types of distinguishability, states, interactions, transformations, fields, constraints, invariants, composition, organization, system-level properties, and relevant Levels.

Iron/ferromagnetism remains an exemplary test case: elemental identity is distinguishable without polarity; one identity admits multiple states; microscopic magnetic moments and interactions permit collective organization; macroscopic polarity can emerge; and that acquired polarity subsequently constrains new interactions and transformations. Thus polarity may be emergent and then formative rather than universally primordial.

V.2 Life Reconstruction

Carry the reconstructed matter categories forward without assuming their sufficiency. Test whether biological identity, persistence, boundary, interaction, transformation, field, and organization can be expressed with the physical formalism, and whether self-maintenance, regulation, reproduction, inheritance, function, information, adaptation, development, and evolution require specializations or genuinely new categories.

V.3 Mind Reconstruction

Repeat the procedure for mind. Test the adequacy of prior categories for representation, meaning, reference, experience, intention, self-modeling, learning, valuation, normativity, memory, and consciousness. Do not infer formal identity from metaphorical continuity with physical or biological terms.

V.4 Social Reconstruction

Examine institutions, languages, organizations, legal systems, markets, cultures, and other social systems whose identity can persist despite replacement of constituents. These provide strong tests of System identity, regulation, context, mapping, distributed agency, whole-part reciprocity, and cross-Level persistence.

V.5 Cross-Level Synthesis

After the four domain reconstructions, classify each candidate category as invariant, transformed, domain-specific, rejected, or newly required. The objective is not a vocabulary intersection but a structural comparison. Where a concept changes form, specify the mapping and what it preserves. Where no adequate mapping exists, retain the distinction rather than forcing unity.

Only at this point should AO evaluate its relationship to Smutsian Holism. If structure, field, regulation, whole-part reciprocity, integration, and creative transformation recur under formal reconstruction, AO may be an elaboration or axiomatic reconstruction of Holism. If the reconstruction retains only part of that architecture, AO may be a successor. If a substantially different architecture emerges, it should be allowed to constitute a new integrative framework.

V.6 Interpretive comparisons after synthesis

Comparisons with ~P, concepts of God, philosophy of mind, historical metaphysics, and theological systems should follow the cross-Level synthesis rather than determine it. These studies can ask whether AO structures correspond to inherited concepts while keeping formal result, empirical adequacy, and interpretation explicitly separate.

Consolidated disposition of the earlier theorem program

The existing UPA theorems should not be discarded. They should be migrated into one of three theorem libraries:

Library	Contents	Example
AO-Core	Results following from the minimal AO formal language across all admitted models.	Identity/mapping preservation only if built into the common model category.
AO-Model Theorems	Results valid in a declared special model: spherical-polar, categorical-polar, semantic, etc.	$\sigma^2=id$; antipodal geometry; geodesic results.
AO-Applied Hypotheses/Theorems	Results requiring empirical or engineered assumptions about mind, groups, harmony, viability, agency.	T7 resilience; T8–T12 consciousness ladder; group ladder.

This structure preserves the intellectual value of the historical theorem corpus while preventing model-specific, empirical, or interpretive conclusions from being presented as universal ontological deductions.

Immediate next work — revised sequence

1. Finish canonical UPA version reconciliation and complete the theorem dependency ledger so the historical baseline is fixed.
 2. Stabilize only the minimum AO v0.1 definitions needed to investigate matter: World, identity criterion, typed distinguishability, state, relation/interaction, transformation, invariant, organization/System, Level, context, field placeholder, and mapping.
 3. Begin the Matter Reconstruction ledger from contemporary fundamental physics, proceeding through fields/interactions, particles, atoms, chemistry, condensed matter, and organized physical systems.
 4. For every matter-domain concept, classify it as primitive within a model, defined, derived, emergent/system-level, context-dependent, or interpretive; construct countermodels wherever a proposed generalization can be challenged.
 5. Use the matter results to revise AO Foundations before carrying the formal vocabulary into Life Reconstruction.
 6. Repeat reconstruction and model testing at Life, then Mind, then Social Organization, allowing new categories at every stage.
 7. Perform the cross-Level synthesis only after the four domain studies; test the Axiomatic Holism Hypothesis against the resulting structure rather than adopting it beforehand.
 8. Defer the comprehensive God-concept and ~P comparison until the cross-Level synthesis provides a stable basis for correspondence.
1. Build a typed distinguishability test suite using chemical identity, molecular polarity, ferromagnetic iron, state changes, and open systems; use it to refine the provisional k-index rather than assuming a taxonomy.
 2. Formalize identity-preserving versus identity-changing transformations and test whether emergent properties can become higher-Level constraints without inserting holism into the definitions.
 3. Freeze a canonical UPA version map: reconcile A4/A8 and other numbering/name drift across revised axiom and theorem pages.
 4. Build a complete theorem index from Appendix B and individual theorem pages, including T1–T12 and group variants, then attach each proof sketch to exact axiom versions.

5. Formalize AO World, System, Level, Identity Criterion, Distinguishability, Relation, and Transformation in mathematical notation.
6. Construct at least three explicit countermodels: non-polar relational World, open-boundary persistent System, and recursive non-binary World.
7. Recast the spherical UPA geometry as AO Model SP and identify exactly which historical theorems remain valid there.
8. Recast the category-theoretic UPA work as AO Model CAT, with polarity as optional involutive structure rather than categorical prerequisite.
9. Only after these steps, attempt the first nontrivial AO theorem about system identity/Level formation and test the Axiomatic Holism Hypothesis.

Standard domain-reconstruction ledger

Each Matter/Life/Mind/Social investigation should use the same ledger so that cross-Level comparison is possible. For every phenomenon or theory, record: domain and Level; candidate identity; basis/type of distinguishability; state space; relations/interactions; transformations; invariants; field or contextual structure; organization/composition; regulation/constraints; emergent system properties; mappings to adjacent Levels; formal model used; counterexamples; empirical warrant; and unresolved vocabulary. This ledger becomes the evidentiary basis for cross-Level induction.

Research status and confidence

Finding	Confidence
UPA should be preserved as a special/model family within AO.	High
Polarity is formally narrower than distinguishability.	High, because explicit non-polar countermodels exist
Spherical geometry is a realization, not a necessary AO geometry.	High
Category theory is a promising AO metalanguage.	High as a tool; open as the unique foundation
1 = Identity is preferable to 1 = bounded Unity.	Promising hypothesis, not established
System/Level can be defined through acquired identity.	Promising, requires formal conditions
AO is ultimately Axiomatic Holism.	Open; should be tested, not assumed
$\sim P$ has no singular nature.	Open; current work only shows singularity is unnecessary
The unnamed '?' is generativity/structure/God/etc.	Undetermined; deliberately not named

Programmatic conclusions added in v1.2

- The explicit AO method is axiomatic systems, reconstruction, and modeling; mathematical treatment is implicit.
- Matter Reconstruction should precede further broad ontological generalization.
- Matter $\rightarrow$ Life $\rightarrow$ Mind $\rightarrow$ Social is an investigative sequence, not a reductive hierarchy.
- Cross-Level recurrence must be demonstrated structurally rather than inferred from shared terminology.
- Holism is a historically motivated hypothesis to be tested by the cross-Level reconstruction.

- The ultimate classification of AO as Axiomatic Holism, successor to Holism, or a new integrative framework remains open.

Historical methodological note: the revised research architecture consciously adapts the inductive direction of Smuts's program of reconsidering matter, life, and mind, while withholding Holism as a conclusion until AO's axiomatic reconstructions and cross-Level models support or fail to support it.

Source note

Primary reconstruction source: OASQ, “Unity and Polarity: Foundations of Mind, World, and Intelligence” master index and linked/recovered UPA materials, including revised Axioms 1, 2, 4, 5, 6, 9, 10, 11, 12; the category-theoretic realization; geometric realization series; revised preface; T7 Identity Layering; T12 Generative Consciousness; and group-consciousness materials. Accessed 13 August 2026.

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