

Cross-Relational Invariance and the Epistemology of Reality: Does Reality Have Symmetry?

Wanhong HUANG
huangwanhong@serendip.ngo

Abstract

If access to reality is relationally, historically, materially, and symbolically situated, epistemology faces a familiar difficulty. Different relational systems may produce heterogeneous manifestations of a possible shared reality, while no observer can simply occupy a position outside all relations from which those manifestations can be compared with reality itself. This paper develops cross-relational invariance as a framework for addressing this problem within a Generative Relational approach.

Let X^* denote a possible ontological referent whose ultimate status remains open, and let $x_{a,t} = \mathcal{M}_{a,t}(X^*; \mathcal{C}_{a,t})$ denote its manifestation within relational system a under historically situated conditions $\mathcal{C}_{a,t}$. The paper examines partial transformations between heterogeneous manifestation spaces and defines cross-relational invariance through structures that remain stable under such transformations. The resulting invariants provide epistemic robustness without being identified with ultimate ontology.

The framework distinguishes cross-relational invariance from literal gauge symmetry, using gauge theory as a limited methodological analogy for the separation of representation-dependent form from transformation-resistant structure. Exact, approximate, local, scale-dependent, and historically persistent invariants are differentiated, while failures of invariance are treated as epistemically informative.

Preliminary cases involving heterogeneous theories of generativity, Daoist symbolic grammars of change, Buddhist configurations of the self, hypothetical non-human cognition, and political-economic forms illustrate how the framework can identify both structural persistence and manifestation-specific categories. The paper argues that epistemic robustness increases when structures survive relevant variation in relational conditions, while such robustness remains compatible with ontological openness and future revision.

Cross-relational invariance therefore provides neither a view from nowhere nor a final criterion of metaphysical truth. It offers a generative procedure for identifying structures that remain intelligible across heterogeneous modes of relational access and for revising those structures when new modes of access become available.

Keywords: cross-relational invariance; relational epistemology; epistemic robustness; symmetry; ontological openness

Discussion Paper Note

This discussion paper develops a specific epistemological problem within the Generative Relational framework: the status of structures that remain stable across heterogeneous relational manifestations of reality. Its principal object is *cross-relational invariance*. The paper asks how such invariance can contribute to knowledge of reality when perception, language, symbolic systems, conceptual schemes, instrumentation, embodiment, historical conditions, and other modes of relational access vary across observers and systems.

The paper does not introduce Generative Relational Epistemology as a new foundational programme. It presupposes the wider Generative Relational commitment that knowledge arises through historically and materially situated relations and develops one narrower problem within that setting. The present inquiry concerns the epistemic significance of structures that persist under changes in relational manifestation and the extent to which such persistence can support claims concerning reality.

The term *reality* is intentionally used in several analytically distinguishable senses. At minimum, the discussion separates

$$\mathfrak{R}^{\text{ont}} ; \mathfrak{R}^{\text{rel}} ; \mathfrak{R}^{\text{epi}} \quad (1)$$

where $\mathfrak{R}^{\text{ont}}$ denotes possible ontological or metaphysical reality, $\mathfrak{R}^{\text{rel}}$ denotes relational reality in the specific Generative Relational sense developed in the preceding discussion, and $\mathfrak{R}^{\text{epi}}$ denotes reality as epistemically accessible within a situated system of perception, representation, inquiry, and practice.

The distinction is methodological. It permits inquiry into epistemically and relationally accessible structures while suspending commitment concerning the ultimate constitution of $\mathfrak{R}^{\text{ont}}$. A possible ontological referent may therefore be represented provisionally as

$$X^*, \quad (2)$$

while its manifestation within relational system a at historical time t is represented as

$$x_{a,t} = \mathcal{M}_{a,t}(X^*; \mathcal{C}_{a,t}). \quad (3)$$

The term $\mathcal{C}_{a,t}$ collects those conditions relevant to the manifestation, including embodiment, perception, language, conceptual grammar, instrumentation, material environment, practice, and historical situation.

Equation 3 should be read as an analytical schema. It expresses dependence of accessible manifestation upon relational conditions while leaving the ontological relation between X^* and $x_{a,t}$ open. The notation therefore accommodates realist, critical-realist, structural-realist, perspectival, idealist, and other metaphysical interpretations whenever their empirical and conceptual commitments remain compatible with the relational analysis under consideration.

Different relational systems may generate different manifestations:

$$x_{a,t} \neq x_{b,s}. \quad (4)$$

Difference at the level of manifestation does not by itself determine whether the systems encounter distinct ontological realities, distinct aspects of a shared reality, or different relational formations produced under partially shared conditions. The epistemological task of the present paper begins from this underdetermination.

Where partial comparison is possible, let

$$G_{ab} : D_{ab} \subseteq \mathcal{X}_a \longrightarrow \mathcal{X}_b \quad (5)$$

denote a cross-relational transformation between domains of manifestation. The transformation may represent translation, reconstruction, coordinate change, conceptual correspondence, empirical calibration, or another domain-specific relation. GR does not assume that such a transformation exists globally, uniquely, or without loss.

Cross-relational invariance concerns structures that remain stable under an appropriate transformation between heterogeneous relational manifestations. Let

$$I_a : \mathcal{X}_a \rightarrow \mathcal{Z}, \quad I_b : \mathcal{X}_b \rightarrow \mathcal{Z}$$

be relationally situated mappings into a common comparison space $\mathcal{Z}$. A provisional invariance condition is

$$I_b \circ G_{ab} = I_a \tag{6}$$

on the relevant comparison domain.

Equation 6 does not require the manifestations themselves to be identical. It permits

$$x_a \neq x_b, \quad I_a(x_a) = I_b(x_b), \tag{7}$$

so that representational, conceptual, perceptual, or symbolic difference can coexist with structural persistence.

The epistemic importance of such persistence is expressed through the concept of *epistemic robustness*. A structure that survives relevant variation in relational conditions acquires stronger support than a structure observed only within one fixed mode of access. This principle remains comparative and revisable:

$$\text{cross-relational invariance} \rightsquigarrow \text{epistemic robustness}. \tag{8}$$

The inference stops before ontological identification. Cross-relational invariance can strengthen confidence that an identified structure is not an artifact of one particular manifestation system, while the further claim that the same structure belongs to reality independently of every possible mode of access requires additional argument. The central distinction is therefore

$$\text{epistemic invariance ; ontological symmetry}. \tag{9}$$

This distinction gives the subtitle *Does Reality Have Symmetry?* its precise role. Symmetry may first be investigated at the level of epistemically accessible manifestations and relationally generated forms. Whether an observed invariance warrants a corresponding claim about $\mathfrak{R}^{\text{ont}}$ remains an open philosophical problem.

Gauge theory provides an important methodological analogy for this inquiry. Physical theories frequently distinguish representation-dependent descriptions from structures preserved under specified transformations. The present paper draws upon this logic of transformation and invariance while keeping cross-relational transformations distinct from physical gauge transformations. A cross-relational map need not possess a group structure, need not generate gauge-equivalent physical states, and may remain partial, historically situated, asymmetric, or lossy.

The paper therefore distinguishes

$$\begin{aligned} \text{Sym}_{\text{rep}} : & \quad \text{symmetry within a representational system,} \\ \text{Inv}_{\text{cross}} : & \quad \text{invariance across relational systems,} \\ \text{Sym}_{\text{ont}} : & \quad \text{symmetry attributed to ontological reality.} \end{aligned} \tag{10}$$

The first can often be formally specified within a theory. The second is the principal object of this paper. The third is an ontological interpretation whose warrant must be examined separately.

Cross-relational invariance is also treated as historically revisable. The set of manifestations available for comparison, the transformations regarded as legitimate, the common comparison spaces constructed by inquiry, and the invariants identified through them can all change:

$$\mathcal{I}_t \longrightarrow \mathcal{I}_{t+1}. \quad (11)$$

An invariant therefore represents structure that has survived the relevant relational variations presently available to inquiry. Future relational systems, instruments, languages, forms of life, or modes of cognition may preserve, refine, fragment, or dissolve it.

This revisability is especially important when the comparison extends beyond ordinary human observers. A hypothetical non-human intelligence may encounter and organize possible reality through perceptual, temporal, symbolic, and conceptual structures radically different from human ones. Such a case does not provide empirical evidence concerning extraterrestrial cognition. It functions as a limiting thought experiment for exposing anthropocentric assumptions in epistemological claims concerning invariance and universality.

The paper consequently approaches objectivity through relational variation. Objectivity need not be represented as access from outside all relations. Within the present framework, a provisional form of objectivity can emerge through the persistence of structure across sufficiently heterogeneous modes of relational access:

Relational variation enables cross-relational comparison; structures that remain invariant across such comparison may acquire provisional epistemic robustness.

The qualifying term *provisional* is essential. Shared embodiment, common historical inheritance, common instruments, shared conceptual constraints, or common forms of error can generate apparent invariance. Agreement alone therefore provides insufficient grounds for ontological closure. The epistemic significance of an invariant depends upon the kinds of variation under which it persists and upon the possibility of identifying shared sources of distortion.

The present paper develops this framework through conceptual analysis, formal reconstruction, and preliminary comparative cases. Daoist representations of generativity, Buddhist analyses of self and dependent formation, political-economic relational forms, modern scientific representations, and hypothetical heterogeneous cognition provide different settings in which manifestation, transformation, and invariance can be examined. These cases serve as tests of the framework and may require revision of its categories.

The scope remains epistemological. The paper does not attempt to establish the ultimate ontology of reality, to derive metaphysical symmetry from epistemic invariance, or to reduce heterogeneous traditions to a common formal language. Its central research problem is narrower:

Which structures remain epistemically robust when the relations through which reality becomes accessible are transformed?

The resulting programme treats invariance as a relational achievement rather than a final possession of truth. Its strongest epistemic claims concern structures that survive specified transformations across heterogeneous modes of access. The ontological meaning of those structures remains subject to further argument, comparison, and revision.

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1 Introduction

This section introduces the epistemological problem that motivates cross-relational invariance. The problem arises from the conjunction of two conditions. Human and other possible forms of knowledge are situated within particular relations of perception, embodiment, language, instrumentation, history, and practice. At the same time, epistemic inquiry frequently seeks claims whose validity extends beyond the particular conditions through which they were first produced. The present paper examines whether structures that remain stable across heterogeneous modes of relational access can provide a basis for such extended epistemic confidence.

The problem concerns several senses of reality already distinguished in the Discussion Paper Note:

$$\mathfrak{R}^{\text{ont}} ; \mathfrak{R}^{\text{rel}} ; \mathfrak{R}^{\text{epi}}.$$

The distinctions permit analysis of epistemically accessible and relationally effective structures while preserving openness concerning reality considered independently of any particular mode of access.

The central proposal is that epistemic robustness may emerge through comparison across relational difference. When a structure persists while the conditions through which reality becomes accessible are transformed, that persistence provides information that cannot be obtained from a single manifestation alone.

1.1 Situated Conditions of Epistemic Access

Knowledge is produced within conditions.

Perception depends upon sensory organization and embodiment. Description depends upon language and conceptual vocabulary. Scientific observation depends upon instruments, measurement procedures, modelling choices, and background theory. Historical knowledge depends upon archives, preservation, classification, interpretation, and inherited conceptual categories. Mathematical representation depends upon selected formal languages and structures. Social knowledge additionally depends upon institutions, power, norms, and historically available practices of recognition.

These conditions do not merely surround an otherwise unconditioned act of knowing. They participate in determining what becomes distinguishable, measurable, representable, and inferentially available.

The paper represents this dependence through the manifestation schema introduced in Equation 3:

$$x_{a,t} = \mathcal{M}_{a,t}(X^*; \mathcal{C}_{a,t}).$$

The index a identifies a relational system and t its historical position. The term $\mathcal{C}_{a,t}$ gathers relevant conditions of access. The resulting manifestation $x_{a,t}$ is therefore situated without being treated as epistemically arbitrary.

This formulation shares a broad concern with philosophical traditions that distinguish reality from the conditions under which it becomes available to knowledge. Kant’s distinction between appearances and things considered independently of the conditions of human cognition provides one influential historical formulation of this problem [3]. More recent accounts of scientific perspectivism have emphasized that scientific knowledge is produced through situated perspectives while retaining the possibility of objective achievement [1]. GR develops the problem through the generative relations among manifestation, comparison, and subsequent knowledge.

1.2 Heterogeneity of Relational Manifestations

Situated access becomes epistemologically significant when different systems manifest possible reality differently.

Let two relational systems produce

$$x_{a,t} \in \mathcal{X}_a, \quad x_{b,s} \in \mathcal{X}_b. \quad (12)$$

Their conditions may differ substantially:

$$\mathcal{C}_{a,t} \neq \mathcal{C}_{b,s}. \quad (13)$$

Consequently,

$$x_{a,t} \neq x_{b,s} \quad (14)$$

may reflect differences in embodiment, perceptual resolution, temporal scale, symbolic organization, instrumentation, conceptual grammar, social practice, or historical experience.

Such heterogeneity occurs even within familiar human inquiry. A physical system can be represented through different coordinate systems, mathematical formalisms, experimental instruments, or theoretical models. A historical event can be encountered through archives produced by different institutions and communities. A person can appear differently within biological, psychological, legal, economic, interpersonal, and first-person descriptions.

The possible range becomes still wider when the comparison includes historically distant cultures or hypothetical forms of non-human cognition.

A relational epistemology therefore cannot assume that successful knowledge must converge upon identical representations.

The relevant possibility is more subtle:

Different manifestations may preserve common structure even when their representational forms remain substantially different.

This possibility provides the entry point for cross-relational invariance.

1.3 Comparison across Relational Systems

Comparison requires some structure through which heterogeneous manifestations can become mutually interpretable.

The paper uses

$$G_{ab} : D_{ab} \subseteq \mathcal{X}_a \longrightarrow \mathcal{X}_b$$

for a partial transformation between relational manifestation spaces.

The transformation is deliberately defined on a restricted domain D_{ab} . Complete translation between heterogeneous systems should not be presumed. Some distinctions available within $\mathcal{X}_a$ may have no corresponding expression within $\mathcal{X}_b$. A transformation may also preserve some relations while altering or losing others.

This partiality is epistemically informative.

A comparison becomes meaningful only after the relevant correspondence has been specified. Cross-relational invariance therefore concerns transformation-relative persistence rather than superficial similarity.

The basic structure introduced in Equation 6,

$$I_b \circ G_{ab} = I_a,$$

expresses this idea. The maps I_a and I_b extract structures into a comparison space $\mathcal{Z}$. Agreement occurs at the level of the identified structure while the original manifestations can remain different.

The epistemological object is consequently neither one manifestation nor a simple average among manifestations. It is the structure that survives a specified relational transformation.

1.4 Relational Variation and Epistemic Robustness

Cross-relational invariance gains epistemic significance through variation.

Agreement among nearly identical systems may provide limited information. Observers who share similar bodies, instruments, languages, assumptions, and historical inheritances may reproduce the same structure because they also share the conditions producing it.

A stronger test arises when a candidate structure survives variation across conditions relevant to its production.

Let

$$\Delta_{\mathcal{C}}(a, b)$$

denote, provisionally, the relevant heterogeneity between the conditions of two relational systems. No universal numerical metric is assumed. The notation simply records that epistemic evaluation must consider how the systems differ and whether those differences bear upon the structure under investigation.

The central intuition can be stated in natural language:

An invariant gains epistemic robustness when it persists across relational variations that could reasonably have altered the structure if that structure were primarily an artifact of a particular mode of access.

This formulation also explains why invariance alone cannot function as an automatic criterion of truth. Two systems may preserve the same structure because they share an unrecognized source of distortion.

Accordingly, epistemic robustness depends upon at least three elements:

(persistence, relevant heterogeneity, distortion analysis) .

The first concerns what survives. The second concerns the variation under which it survives. The third concerns alternative explanations for the observed persistence.

Cross-relational epistemology therefore treats robustness as an achievement of structured comparison rather than a count of agreeing observers.

1.5 Reality across Epistemic and Ontological Domains

The word *reality* in the title carries an intentional tension.

At the epistemic level, the paper can investigate structures appearing across multiple manifestations:

$$\mathfrak{R}^{\text{epi}}.$$

At the level of relational reality, it can investigate forms whose stabilization and subsequent causal participation remain observable across relational systems:

$$\mathfrak{R}^{\text{rel}}.$$

The corresponding ontological question concerns

$$\mathfrak{R}^{\text{ont}},$$

the reality whose ultimate constitution may exceed any currently available mode of relational access.

These domains can support different meanings of symmetry.

A symmetry within epistemically accessible reality may concern preservation across representations. A symmetry within relational reality may concern stable structures in generative relations. A claim concerning ontological symmetry attributes corresponding structure to reality independently of the manifestations through which it becomes known.

The inferential transition among these domains therefore requires care.

Cross-relational invariance may strengthen confidence that a structure exceeds the peculiarities of one manifestation without establishing that the same structure constitutes reality in itself.

This distinction provides the philosophical center of the paper.

1.6 Symmetry as an Epistemological Resource

Symmetry offers a particularly powerful language for thinking about representation and invariance. In mathematics and physics, transformations can alter a description while preserving selected structures. Modern physical theories provide especially sophisticated examples of this relationship between transformation and invariance [9].

The present paper draws upon this intellectual resource while maintaining a distinction between formal symmetry and cross-relational comparison.

A physical gauge transformation belongs to a specified formal theory and possesses mathematical structure defined by that theory. Cross-relational transformations may connect systems whose symbolic, conceptual, historical, or perceptual architectures are heterogeneous. Such transformations can be partial, lossy, asymmetric, and historically reconstructed.

The relationship is therefore methodological.

Gauge reasoning demonstrates how variation in representation can coexist with preservation of structure. Cross-relational epistemology asks whether an analogous principle can guide comparison across more heterogeneous forms of access.

The three relevant domains can be summarized compactly as

$$\text{Sym}_{\text{rep}} ; \text{Inv}_{\text{cross}} ; \text{Sym}_{\text{ont}} .$$

Their distinctions will be developed formally in later sections.

1.7 Generative Character of Epistemic Structures

Knowledge within GR is itself part of relational dynamics.

A manifestation can be interpreted, formalized, recorded, institutionalized, and acted upon:

$$x_{a,t} \rightsquigarrow K_{a,t} \rightsquigarrow \mathfrak{R}_{a,t+1}, \tag{15}$$

where $K_{a,t}$ denotes a historically situated epistemic formation.

Knowledge therefore participates in the systems through which later manifestations arise.

Scientific models alter instrumentation and experimental design. Legal classifications alter institutional treatment. Economic theories alter policy and market practice. Cosmological and religious interpretations can alter ritual, conduct, social relations, and subsequent modes of interpretation.

Cross-relational invariants are subject to the same recursion. Once an invariant has been identified and accepted, it can guide future observation, classification, translation, and theory

construction. The later epistemic field therefore differs from the field within which the invariant was first identified:

$$\mathcal{I}_t \rightsquigarrow K_{t+1} \rightsquigarrow \mathcal{C}_{t+1}. \quad (16)$$

This generative participation prevents invariance from becoming a static picture of timeless knowledge. Invariants have histories. Their identification changes inquiry, and subsequent inquiry can transform the invariants regarded as epistemically significant.

1.8 Epistemic Commitment and Revisability

The framework therefore supports graduated and revisable epistemic commitment.

A structure that appears in one manifestation may be treated as a local epistemic result. A structure preserved across multiple well-justified transformations acquires stronger robustness. A structure surviving substantial relevant heterogeneity may justify a correspondingly stronger epistemic commitment.

The resulting progression can be expressed schematically:

local manifestation $\rightarrow$ cross-relational comparison $\rightarrow$ persistent structure $\rightarrow$ stronger epistemic commitment.

The progression remains historically open because later modes of access can challenge an earlier invariant:

$$\mathcal{I}_t \longrightarrow \mathcal{I}_{t+1}. \quad (17)$$

Revision can preserve an earlier invariant, restrict its domain, reinterpret its meaning, decompose it into several structures, or remove its privileged epistemic status.

The framework thereby links epistemic robustness with epistemic humility. Confidence can increase without requiring closure.

1.9 Contribution and Scope

The paper makes four principal contributions.

First, it develops *cross-relational invariance* as a distinct epistemological object. The concept concerns structures preserved across heterogeneous relational manifestations under explicitly justified partial transformations.

Second, it distinguishes epistemic robustness from ontological inference. Persistent structure can warrant stronger epistemic commitment while the metaphysical interpretation of that structure remains a further problem.

Third, it develops a limited symmetry and gauge analogy. The analogy supplies a formal intuition for transformation-resistant structure while preserving the differences between physical gauge transformations and heterogeneous cross-relational mappings.

Fourth, it situates invariance within generative historical processes. Manifestations, comparison spaces, transformations, invariants, and epistemic standards can all change through subsequent inquiry.

The paper does not provide a universal algorithm for constructing cross-relational maps. Their construction remains domain-specific. Nor does it assume that every pair of relational systems possesses a common comparison space. Failure of comparison and failure of invariance are themselves epistemically relevant outcomes.

The central commitment can therefore be stated without metaphysical closure:

Objectivity can be approached through the persistence of structure across relevant relational variation, while the ontological interpretation of that persistence remains open to further inquiry.

1.10 Organization of the Discussion

Section 2 situates the framework among philosophical treatments of appearance, perspectival knowledge, structural realism, symmetry, and invariance. Section 3 develops the architecture of relational manifestation and epistemic access. Section 4 examines partial transformations between heterogeneous relational spaces. Section 5 develops the concept and varieties of cross-relational invariance. Section 6 clarifies the relation between the framework and symmetry or gauge reasoning.

Section 7 develops epistemic robustness under relational variation, including shared distortion and failure of invariance. Section 8 applies the framework to preliminary cases involving generative cosmologies, Daoist manifestations of change, Buddhist analyses of subjecthood, political-economic forms, and hypothetical heterogeneous cognition. Section 9 examines the ontological interpretation of invariant structure and the resulting degrees of epistemic commitment. Section 10 develops conceptual boundaries and research obligations. The conclusion returns to the question posed in the subtitle and identifies the conditions under which the symmetry of manifestations may, or may not, support further claims concerning reality.

2 Philosophical Lineages of Reality, Invariance, and Perspectival Knowledge

This section situates cross-relational invariance among several philosophical traditions concerned with the relation between reality, representation, perspective, structure, and transformation. The relevant lineages do not form a single historical sequence, and the present framework does not attempt to synthesize them into one metaphysical position. Their importance lies in the distinct resources they provide for separating conditions of access from claims concerning reality, for understanding objectivity under changing representations, and for identifying structures that remain epistemically significant across such changes.

The discussion proceeds through five interfaces: the distinction between reality and conditions of cognition, structural approaches to scientific knowledge, perspectival accounts of representation, invariance and symmetry, and the limits of transferring formal symmetry concepts into heterogeneous relational inquiry.

2.1 Reality and Conditions of Cognition

A foundational problem for the present paper is already visible in Kant’s distinction between appearances and things considered independently of the conditions of human cognition [3]. Human knowledge is structured through forms and categories that participate in the constitution of experience. The epistemic object available to cognition therefore cannot simply be identified with reality considered independently of those conditions.

GR shares the methodological importance of this separation while leaving the specific Kantian architecture behind. The relevant distinction is expressed through

$$X^* ; x_{a,t},$$

where X^* marks a possible ontological referent and $x_{a,t}$ denotes a manifestation available within a historically situated relational system.

The index a extends the problem beyond a single universal human cognitive architecture. Different bodies, perceptual systems, languages, instruments, formal grammars, institutions, and historical conditions may generate different modes of access.

The resulting epistemological problem therefore concerns plurality among conditions of manifestation:

$$\mathcal{C}_{a,t} ; \mathcal{C}_{b,s} ; \mathcal{C}_{c,u} ; \dots$$

This plurality introduces a problem that becomes especially important for GR. Knowledge cannot rely upon an immediate comparison between a manifestation and reality outside every relational condition. Inquiry can nevertheless compare manifestations produced under different conditions.

Cross-relational invariance begins from that possibility.

2.2 Structure and Scientific Continuity

Structural realism provides a second important interface. Worrall’s influential formulation argues that episodes of theoretical change may preserve important mathematical or structural relations even when the ontological interpretation of the entities described by successive theories changes substantially [10].

The historical motivation is significant for the present paper. Scientific change does not always preserve the same objects, concepts, or explanatory vocabularies. Continuity may instead appear in relations or mathematical structures that survive a transition between theories.

A schematic form is

$$T_1 \longrightarrow T_2, \quad \mathcal{S}(T_1) \approx \mathcal{S}(T_2),$$

where $\mathcal{S}$ denotes some structure preserved through theoretical change.

GR shares the interest in structure that survives representational transformation. Its problem is broader in one respect. The relevant transformations may occur between scientific theories, but they may also occur between historically different conceptual systems, different instruments, different scales of observation, different cultural grammars, or hypothetically different cognitive architectures.

The object of inquiry is therefore not restricted to structural continuity between theories. It concerns persistence across heterogeneous relations of access.

Structural realism also provides an important caution. The preservation of structure across theories can support realism concerning that structure, but the move from structural continuity to ontological commitment remains philosophically contested. GR retains this tension rather than resolving it in advance.

Structural persistence can justify stronger epistemic commitment while the ontological interpretation of the preserved structure remains a further question.

This distinction will become central when cross-relational invariance is connected to the subtitle’s question concerning symmetry in reality itself.

2.3 Perspectival Scientific Knowledge

Scientific perspectivism provides a third interface. Giere develops an account of scientific knowledge in which observations, models, and representations are associated with particular perspectives while scientific objectivity remains possible [1]. Perspectival dependence therefore does not reduce scientific knowledge to arbitrary individual opinion.

This is particularly relevant to GR because different relational manifestations can be simultaneously situated and epistemically valuable.

A perspective selects and organizes relations through specific conditions: instrumental resolution, representational conventions, modelling purposes, background concepts, and practical interests. Variation among perspectives can reveal different features of the same domain.

GR extends this insight through a stronger emphasis on generative conditions. A manifestation is produced within a configuration that can itself change:

$$x_{a,t} = \mathcal{M}_{a,t}(X^*; \mathcal{C}_{a,t}).$$

The conditions of access are therefore historical and dynamically reproducible. Scientific practices can change instruments; instruments can make new phenomena available; new phenomena can reorganize conceptual frameworks; conceptual frameworks can redirect subsequent observation.

Perspectives are consequently embedded within a generative cycle rather than functioning only as fixed viewpoints.

This difference also matters for comparison. Cross-relational invariance asks what survives when the perspective-producing conditions themselves vary.

2.4 Representation, Selection, and Distortion

Van Fraassen’s work on scientific representation offers another relevant resource. Scientific representation does not require a simple mirroring relation between representation and represented object. Representation involves selective use, interpretation, modelling, idealization, and context-sensitive practices [8].

This perspective is useful for cross-relational analysis because a manifestation can remain epistemically successful while differing substantially from another manifestation in form.

A map, an equation, an image, a verbal description, and a simulation may represent related structures through different representational resources. Their differences do not disappear under successful comparison.

The present framework therefore avoids requiring

$$x_a = x_b$$

as a condition of epistemic convergence.

The relevant problem concerns the preservation of selected relations across difference.

Representation also introduces the possibility of systematic distortion. A structure may appear stable across several representations because the representations share a modelling convention, an instrument, a cognitive limitation, or an institutional practice.

Cross-relational invariance must consequently be interpreted together with the conditions under which the relevant manifestations were generated.

This yields an important distinction:

Persistence across representations is epistemically stronger when the conditions capable of producing the same distortion have also been varied.

The later account of epistemic robustness will develop this point in greater detail.

2.5 Symmetry and Invariance

Symmetry provides the most direct formal lineage for the present paper. Weyl describes symmetry through transformations under which a relevant structure remains unchanged, connecting geometric, mathematical, physical, and aesthetic uses of the concept [9].

The general form can be expressed compactly. For a transformation g and an invariant structure I ,

$$I(gx) = I(x).$$

The epistemological significance of this pattern is considerable. Representation can vary while a relation, quantity, or structural property remains fixed.

Modern physics provides particularly powerful realizations of this idea. Coordinate transformations, spacetime symmetries, and gauge transformations show that aspects of mathematical description can change without altering specified physically significant structures.

For GR, the conceptual attraction is clear. If different relational systems generate different manifestations, perhaps some structures remain stable under transformations between those manifestations.

The analogy, however, requires discipline. A transformation between historically or cognitively heterogeneous relational systems may lack the formal properties associated with a mathematical symmetry group. Its domain may be partial. Its inverse may be unavailable. Composition may introduce loss. The spaces being compared may differ in dimension, conceptual organization, or representational grammar.

The present paper therefore adopts the logic of *variation with preservation* while reserving the term *gauge transformation* for cases in which the required formal structure is actually established.

2.6 Gauge Freedom and Representational Redundancy

Gauge theories sharpen the distinction between variation in description and variation in physical content. Different mathematical configurations may represent the same physical situation when related by an appropriate gauge transformation. The representational difference can therefore exceed the physical difference represented by the theory.

This structure provides a useful epistemological analogy:

variation in description ; variation in represented structure.

For cross-relational inquiry, the corresponding problem is whether differences between manifestations arise from differences in reality, differences in conditions of access, differences in representational organization, or some combination of these.

The analogy becomes especially attractive when several manifestations can be related through a transformation that preserves a common structure.

Nevertheless, cross-relational equivalence is generally weaker than gauge equivalence. A gauge transformation is defined within a formal theoretical architecture. A cross-relational transformation can connect historically different systems whose vocabularies, perceptual structures, or ontological commitments are themselves heterogeneous.

The present framework therefore uses *gauge-like* reasoning only at the level of methodological analogy.

Gauge theory demonstrates that difference in representation need not imply difference in the represented structure. Cross-relational epistemology asks how far this insight can travel when the representational systems themselves are heterogeneous.

The limits of this analogy will be developed separately in Section 6.

2.7 Objectivity through Invariance

The relationship between objectivity and invariance has also appeared more directly in twentieth- and twenty-first-century philosophy. Nozick, for example, treats invariance under transformations as a central resource for thinking about objectivity and reality [7].

This lineage is especially close to the present problem. A feature that remains unchanged across transformations appears less dependent upon the particular standpoint from which it was initially represented.

GR accepts the epistemic force of this intuition while introducing two qualifications.

The first concerns heterogeneity. The epistemic importance of invariance depends upon the kinds of transformations under which the structure persists. Repetition within nearly identical conditions provides less independence from the original conditions than persistence across substantially different relevant conditions.

The second concerns generativity. Invariants are discovered, formulated, institutionalized, and used within historical relational systems. Once accepted, they influence later observation and theory formation. The epistemic environment after recognition of an invariant is therefore different from the environment before its recognition.

Objectivity through invariance must consequently remain historically revisable.

2.8 Relational Reality and Epistemic Invariance

The concept of relational reality developed in the preceding GR discussion adds a further distinction absent from many standard accounts of invariance.

A relationally real form can arise through relations and subsequently participate in the generation, reproduction, or transformation of later relations:

$$\mathfrak{R}_t \rightsquigarrow X_t^{\text{rel}} \rightsquigarrow \mathfrak{R}_{t+1}.$$

Its relational reality therefore concerns generative efficacy and persistence within a specified system and temporal horizon.

Epistemic invariance concerns another question: whether some structure associated with such a form persists across transformations of the relations through which it becomes accessible.

The two concepts should remain distinct.

A form may be strongly relationally real within one system while lacking cross-relational invariance. Money in a particular institutional regime, a historically local legal category, or a culturally specific sacred form may exert substantial generative effects without preserving the same structure when translated into another relational system.

Conversely, an invariant mathematical relation may exhibit strong cross-relational robustness even when it is not itself a relationally real social entity in the same sense.

The relationship between the two domains is therefore one of possible intersection:

$$\mathfrak{R}^{\text{rel}} \cap \mathfrak{R}^{\text{epi}}$$

rather than conceptual identity.

This distinction is essential for the title of the paper. The symmetry of epistemically accessible structures, the persistence of relationally real forms, and symmetry attributed to ontological reality represent different claims.

2.9 Historical Transformation and Epistemic Persistence

Cross-relational invariance also extends the problem of invariance into historical time.

Successive epistemic systems may differ in concepts, instruments, scales, languages, and theoretical commitments:

$$\mathcal{C}_{a,t_1} \neq \mathcal{C}_{a,t_2}.$$

A candidate invariant may nevertheless persist across the transition.

This possibility connects the present framework with structural continuity in science while extending the comparison beyond scientific theory change. Religious cosmologies, legal categories, economic representations, mathematical systems, and everyday perceptual classifications can all undergo historical transformation.

An epistemically important structure may therefore be: temporally persistent, cross-cultural, cross-instrumental, cross-theoretical, or preserved across several of these forms of variation.

No single type of persistence receives automatic priority. The epistemic importance of each depends upon the question being investigated.

Historical persistence also introduces revision. A structure treated as invariant at one stage may later prove to depend upon a previously unvaried condition.

The history of inquiry therefore supplies new transformations against which earlier invariants can be tested.

2.10 Relational Plurality and Metaphysical Restraint

The lineages reviewed above support a common methodological possibility: epistemic inquiry can proceed through representation-dependent and perspectival forms without requiring either immediate metaphysical realism or unrestricted relativism.

GR formulates this position through relational plurality.

Different systems may produce different manifestations:

$$x_a \neq x_b.$$

Some relations among those manifestations may nevertheless remain stable.

The resulting invariant can support epistemic commitment proportional to the range and relevance of the transformations it has survived. Its metaphysical meaning remains separately contestable.

This position preserves two forms of openness simultaneously. It allows epistemic claims to become stronger through comparison, and it leaves those claims revisable when new modes of relational access become available.

The relevant methodological commitment can be stated as follows:

Epistemic plurality does not prevent the discovery of persistent structure, and persistent structure does not by itself close the metaphysical question of what reality ultimately is.

2.11 Conceptual Interface for Cross-Relational Invariance

The preceding lineages contribute different elements to the present framework.

Kant supplies a disciplined separation between conditions of cognition and claims concerning reality beyond those conditions. Structural realism highlights continuity of structure under theoretical change. Scientific perspectivism demonstrates that situated representation can coexist with objectivity. Work on scientific representation clarifies the selective and mediated character of epistemic access. Symmetry and gauge theory provide a formal paradigm of variation with preservation. Accounts of invariance and objectivity motivate the epistemic significance of structures that survive transformations.

GR combines these resources around a different unit of analysis: heterogeneous relational manifestation.

The conceptual sequence developed in the remainder of the paper is

manifestation $\rightarrow$ relational transformation $\rightarrow$ structural persistence $\rightarrow$ epistemic robustness $\rightarrow$ ontological interpretation

Each transition carries a separate burden of justification.

The first concerns the conditions through which a manifestation becomes available. The second concerns the legitimacy and domain of comparison. The third concerns the identification of an invariant. The fourth concerns the epistemic significance of persistence under relevant heterogeneity. The fifth concerns the extent to which epistemic invariance supports claims about reality beyond the manifestations compared.

The next section develops the first of these transitions by specifying the architecture of relational manifestation and epistemic access.

3 Relational Manifestation and Epistemic Access

This section develops the architecture through which a possible reality becomes epistemically available within a relational system. The purpose is to specify the components of manifestation before introducing transformations between different manifestation spaces. The central distinction concerns a possible ontological referent, the conditions through which it becomes accessible, the resulting manifestation, and the further representations produced from that manifestation.

The basic schema is

$$x_{a,t} = \mathcal{M}_{a,t}(X^*; \mathcal{C}_{a,t}), \quad (18)$$

where X^* denotes a possible ontological referent, $\mathcal{C}_{a,t}$ denotes the relevant conditions of access, and $x_{a,t}$ denotes the manifestation available to relational system a at historical time t .

The notation is intentionally asymmetric in epistemic status. $x_{a,t}$ is accessible through inquiry, while X^* marks the open ontological problem from which direct access is not presupposed.

3.1 Ontological Referent and Relational Manifestation

The distinction between X^* and $x_{a,t}$ is methodological rather than a commitment to a specific metaphysics.

The symbol X^* marks whatever may underlie, participate in, constrain, or otherwise stand in relation to the manifestation under consideration. Depending upon the philosophical interpretation, X^* may be treated as a mind-independent object, a process, a structural domain, an event, a field, a metaphysical reality, or an ultimately indeterminate referent.

GR does not require these interpretations to converge before relational analysis can begin.

The manifestation $x_{a,t}$ refers to what becomes available within a particular relational configuration:

$$X^* ; x_{a,t}.$$

The semicolon indicates analytical separation without specifying a complete ontological theory of the relation between the two terms.

A manifestation therefore should not be understood as a simple duplicate of an independently completed object. It is the form in which something becomes epistemically available under particular conditions of relation.

This distinction also leaves open the possibility that different manifestations disclose different aspects of a possible shared reality:

$$x_{a,t} \neq x_{b,s}.$$

Difference between manifestations can therefore be epistemically meaningful without deciding in advance whether the underlying ontological referent is one, many, or differently constituted.

3.2 Conditions of Manifestation

The condition set $\mathcal{C}_{a,t}$ collects the relations that participate in the production of a manifestation.

A provisional decomposition is

$$\mathcal{C}_{a,t} = (B_{a,t}, P_{a,t}, L_{a,t}, F_{a,t}, I_{a,t}, M_{a,t}, S_{a,t}, H_{a,t}), \quad (19)$$

where the components denote:

- $B_{a,t}$: bodily and sensory organization;
- $P_{a,t}$: perceptual capacities and resolutions;
- $L_{a,t}$: linguistic and symbolic resources;
- $F_{a,t}$: conceptual and formal structures;
- $I_{a,t}$: instruments and measurement systems;
- $M_{a,t}$: material and environmental conditions;
- $S_{a,t}$: social and institutional organization;
- $H_{a,t}$: historical conditions and inherited knowledge.

The decomposition is provisional and domain-dependent. A specific inquiry may require additional components or may combine several of those listed above.

The central point is that manifestation is conditional upon a relational configuration rather than generated through a single isolated channel.

A manifestation records how reality becomes available within a configuration of relations; it therefore carries information about both the encountered domain and the conditions through which the encounter occurs.

This dual dependence becomes central when manifestations are compared.

3.3 Embodiment and Perceptual Organization

Embodiment supplies one of the most immediate conditions of epistemic access.

Different sensory architectures distinguish different ranges of frequency, scale, intensity, duration, and spatial organization. A manifestation available through unaided human vision differs from one mediated through infrared detection, microscopy, radio observation, or another sensory system.

A relational system therefore possesses a domain of perceptual accessibility, which may be written provisionally as

$$\Omega_{a,t}^P \subseteq \Omega^{\text{possible}}.$$

The expression does not imply that Ω^{possible} is presently known in its entirety. It records the more limited point that a particular perceptual system accesses only some range of possible distinctions.

Instrumentation can expand, reorganize, or translate this range:

$$\Omega_{a,t}^P \longrightarrow \Omega_{a,t+1}^P.$$

Consequently, historical changes in perceptual technology can generate new manifestations of domains previously inaccessible to ordinary perception.

Embodiment therefore participates directly in the history of knowledge.

3.4 Language and Symbolic Grammar

Manifestation also becomes organized through language and symbolic grammar.

A relational system does not merely receive perceptual variation. It distinguishes, names, combines, classifies, and relates what becomes available.

Let

$$\Sigma_{a,t}$$

denote a historically situated symbolic grammar through which manifestations can be represented and manipulated.

The relation can be written as

$$x_{a,t} \rightsquigarrow \Sigma_{a,t}(x_{a,t}), \quad (20)$$

where the right-hand term denotes a symbolic articulation of the manifestation.

Different grammars may preserve different structures:

$$\Sigma_{a,t} \neq \Sigma_{b,s}.$$

One system may privilege continuous quantities, another categorical distinctions, another relational patterns, and another temporal sequences. Mathematical, legal, religious, scientific, and ordinary linguistic grammars can therefore organize different aspects of a domain.

The distinction between manifestation and symbolic articulation is important. The two may become tightly coupled in practice, but their analytical separation allows GR to ask which structures derive from the encountered domain and which arise through the grammar used to articulate it.

This distinction becomes especially important in later cross-relational comparison.

3.5 Conceptual and Formal Structures

Conceptual structures organize manifestations beyond immediate linguistic description.

Scientific concepts, mathematical spaces, causal models, ontological categories, classificatory systems, and interpretive schemas determine which relations can be represented and which transformations can be formulated.

Let

$$\mathcal{F}_{a,t}$$

denote the conceptual-formal space available to system a .

A manifestation can then be mapped into this space:

$$\phi_{a,t} : x_{a,t} \longmapsto f_{a,t} \in \mathcal{F}_{a,t}. \quad (21)$$

The formalized object $f_{a,t}$ may preserve selected relations while suppressing others.

A dynamical equation, for example, may preserve temporal dependence while discarding visual appearance. A legal classification may preserve institutionally relevant status while ignoring

biological detail. A statistical representation may preserve distributions while suppressing individual histories.

Formalization therefore involves selective preservation.

This provides one reason why cross-relational invariance cannot be identified through superficial similarity between representations. The relevant question concerns which structures survive the selective transformations through which representations are produced.

3.6 Instrumentation and Material Mediation

Instruments participate actively in manifestation.

A telescope, microscope, particle detector, imaging system, archive, database, sensor network, or statistical pipeline does more than transmit a completed reality into observation. Each establishes specific relations among scale, resolution, selection, noise, calibration, and interpretation.

An instrument-mediated manifestation may be represented as

$$x_{a,t}^I = \mathcal{M}_{a,t}(X^*; \mathcal{C}_{a,t}, I_{a,t}). \quad (22)$$

Changes in instrumentation can therefore produce new manifestation spaces:

$$\mathcal{X}_{a,t} \longrightarrow \mathcal{X}_{a,t+1}.$$

The epistemological significance of instrumentation extends beyond scientific technology. Archives, writing systems, maps, accounting practices, legal records, ritual objects, and digital platforms can all preserve and reorganize what becomes epistemically available.

Material mediation is consequently part of the relational architecture of knowledge.

3.7 Scale and Resolution

Manifestations also depend upon scale.

A system can appear stable at one temporal or spatial resolution and highly dynamic at another. A social institution may appear as a persistent entity over decades while consisting of rapidly changing interpersonal relations at a shorter timescale. A biological organism may appear as a stable individual while molecular processes continuously change within it.

Let

$$\sigma_{a,t}$$

denote a scale of access.

The manifestation should therefore be understood as scale-indexed:

$$x_{a,t}^{(\sigma)} = \mathcal{M}_{a,t}^{(\sigma)}(X^*; \mathcal{C}_{a,t}). \quad (23)$$

Two apparently conflicting descriptions may therefore arise from different scales:

$$x_{a,t}^{(\sigma_1)} \neq x_{a,t}^{(\sigma_2)}.$$

Cross-relational comparison must specify whether a candidate invariant is expected to survive scale transformation.

This will later motivate the distinction between global and scale-dependent invariance.

3.8 Historical Conditions of Access

Epistemic access is historically situated.

The available concepts, instruments, archives, mathematical techniques, institutions, and practical problems differ across periods. A relational system at time t_2 can therefore access structures unavailable to the same broad community at time t_1 .

The historical development of manifestation conditions can be represented as

$$\mathcal{C}_{a,t} \longrightarrow \mathcal{C}_{a,t+1}. \quad (24)$$

Consequently,

$$x_{a,t} \longrightarrow x_{a,t+1} \quad (25)$$

may occur even when inquiry concerns a domain treated as historically stable.

The change can result from improved measurement, altered concepts, new archives, different political conditions, new mathematical formalisms, or the appearance of previously unavailable evidence.

Historical change therefore generates epistemic variation within one broad relational system.

Cross-relational invariance includes this diachronic dimension.

3.9 Manifestation and Representation

The distinction between manifestation and representation requires explicit clarification.

A manifestation is the form in which something becomes accessible within a relational system. A representation is a further organization of that manifestation through a symbolic, conceptual, material, or formal medium.

The sequence can be written as

$$X^* ; x_{a,t} \rightsquigarrow r_{a,t}, \quad (26)$$

where $r_{a,t}$ denotes a representation.

The same manifestation can support multiple representations:

$$x_{a,t} \rightsquigarrow \left\{ r_{a,t}^{(1)}, r_{a,t}^{(2)}, \dots, r_{a,t}^{(n)} \right\}.$$

Conversely, a representation may integrate several manifestations.

This distinction is useful because symmetry can operate at different levels. A change between two representations within one manifestation system differs from a transformation between manifestation systems themselves.

The former may involve ordinary representational symmetry. The latter belongs to the cross-relational problem developed in this paper.

3.10 Relational Reality and Manifestational Reality

Relational manifestation should also remain distinct from relational reality.

A manifestation becomes epistemically available:

$$X^* ; x_{a,t}.$$

A relationally real form additionally participates in subsequent generative dynamics:

$$\mathfrak{R}_t \rightsquigarrow X_t^{\text{rel}} \rightsquigarrow \mathfrak{R}_{t+1}.$$

The two categories can overlap.

A scientific model, religious symbol, monetary form, legal classification, or social identity may first become epistemically manifested and subsequently acquire sufficient stability to influence later action and relations.

In such cases,

$$x_{a,t} \rightsquigarrow X_t^{\text{rel}}.$$

The transition is analytically important because knowledge can become part of the reality through which later knowledge is generated.

3.11 Generative Participation of Knowledge

Epistemic structures do not remain outside the systems they describe.

Once a manifestation has been interpreted, stabilized, communicated, and institutionalized as knowledge, it may influence later relations:

$$x_{a,t} \rightsquigarrow K_{a,t} \rightsquigarrow \mathfrak{R}_{a,t+1}. \quad (27)$$

The transformed relational field can alter later conditions of access:

$$\mathfrak{R}_{a,t+1} \rightsquigarrow \mathcal{C}_{a,t+1}. \quad (28)$$

The full cycle is therefore

$$X^* ; x_{a,t} \rightsquigarrow K_{a,t} \rightsquigarrow \mathfrak{R}_{a,t+1} \rightsquigarrow \mathcal{C}_{a,t+1} \rightsquigarrow x_{a,t+1}. \quad (29)$$

This cycle gives epistemology a generative and historical structure.

A theory changes experiments. An archive changes historical interpretation. A classification changes institutions. An economic model changes policy. A religious cosmology changes practice. The transformed practice then alters the conditions under which subsequent manifestations arise.

Knowledge therefore participates in the production of later epistemic worlds.

3.12 Observer Position and Reflexive Access

The relational system performing the analysis is itself situated.

Let

$$O_{a,t}$$

denote an observer or epistemic position within system a .

An observed manifestation may then be written as

$$\hat{x}_{a,t} = \mathcal{O}_{a,t}(x_{a,t}; K_{O,t}), \quad (30)$$

where $K_{O,t}$ denotes the observer's available knowledge, methods, and interpretive resources.

This introduces a second layer of relational conditioning:

$$X^* ; x_{a,t} \rightsquigarrow \hat{x}_{a,t}.$$

The distinction matters particularly in historical, social, and comparative research, where the researcher participates in the production of the analytical representation.

Cross-relational analysis must therefore examine the relational conditions of both the original manifestation and its later reconstruction.

3.13 Heterogeneous Cognitive Systems

The framework does not restrict relational systems to ordinary human observers.

A hypothetical system b may possess perceptual, temporal, linguistic, or computational capacities radically different from those of humans:

$$\mathcal{C}_{a,t} \neq \mathcal{C}_{b,s}.$$

Consequently,

$$\mathcal{X}_a \neq \mathcal{X}_b$$

may involve more than different vocabularies applied to the same perceptual objects. The systems may distinguish different primitive structures, different temporal resolutions, or different relations among phenomena.

This possibility functions as a limiting case for epistemology.

A claim of universality becomes stronger when its validity does not depend upon features unique to the relational architecture through which humans happen to encounter reality.

The thought experiment does not require knowledge of actual extraterrestrial cognition. Its purpose is to expose assumptions that remain invisible when all compared observers share broadly similar biological and cultural conditions.

3.14 Manifestational Plurality and Epistemic Constraint

Relational plurality does not imply unrestricted interpretive freedom.

Manifestations are constrained by the relations through which they arise. Some representations fail prediction, intervention, coordination, or cross-system translation. Some disappear when instruments improve. Others persist across changes in observer, method, scale, or theory.

The present framework therefore treats manifestation as both situated and constrained.

A useful distinction is:

Relational dependence explains why manifestations can differ; relational constraint explains why every manifestation is not equally viable.

This combination creates the space in which cross-relational invariance can be epistemically meaningful.

If manifestations were identical across all systems, invariance would add little information.

If manifestations were unconstrained and mutually incomparable, invariance would be impossible to identify.

The relevant epistemological domain lies between these extremes.

3.15 Architecture of Relational Manifestation

The architecture developed in this section can now be summarized as

$$\begin{aligned} X^* ; x_{a,t} &= \mathcal{M}_{a,t}(X^*; \mathcal{C}_{a,t}), \\ x_{a,t} &\rightsquigarrow r_{a,t}, \\ x_{a,t} &\rightsquigarrow K_{a,t}, \\ K_{a,t} &\rightsquigarrow \mathfrak{R}_{a,t+1}, \\ \mathfrak{R}_{a,t+1} &\rightsquigarrow \mathcal{C}_{a,t+1}. \end{aligned} \tag{31}$$

The sequence distinguishes ontological reference, manifestation, representation, knowledge formation, relational participation, and historical change in the conditions of access.

The central epistemological consequence is that manifestations cannot be compared responsibly without specifying how they were generated.

Cross-relational invariance therefore requires more than placing two representations side by side. It requires an account of the conditions that produced them, the structures preserved or transformed between them, and the domain within which comparison remains meaningful.

The next section develops the transformations through which such comparison can be carried out.

4 Cross-Relational Transformations

This section develops the transformations through which heterogeneous relational manifestations can become comparable. The purpose is to specify the conditions under which a mapping between manifestation spaces can be constructed, what such a mapping preserves or changes, and how its limitations enter subsequent epistemic judgment.

Cross-relational comparison begins with two manifestation spaces,

$$\mathcal{X}_a \quad \text{and} \quad \mathcal{X}_b,$$

generated under relational conditions $\mathcal{C}_{a,t}$ and $\mathcal{C}_{b,s}$. A cross-relational transformation is represented provisionally as

$$G_{ab} : D_{ab} \subseteq \mathcal{X}_a \longrightarrow \mathcal{X}_b, \quad (32)$$

where D_{ab} denotes the domain for which a justified correspondence can be constructed.

The restriction to D_{ab} is fundamental. Heterogeneous relational systems may share only limited structures, and comparison may remain local to particular variables, scales, events, relations, or functions.

4.1 Transformation as Constructed Correspondence

A cross-relational transformation is a constructed correspondence between manifestations generated under different conditions of access.

The transformation can arise through several procedures. These include translation between symbolic systems, calibration between instruments, coordinate conversion, reconstruction between theoretical descriptions, comparison of functional roles, historical interpretation, or mapping between different observational scales.

The general problem can be represented as

$$x_a \xrightarrow{G_{ab}} \tilde{x}_b,$$

where $\tilde{x}_b$ denotes the image of x_a within the relational space of system b .

The image need not coincide with the manifestation independently generated by system b :

$$\tilde{x}_b \neq x_b.$$

The relation between these two terms becomes epistemically informative. Strong agreement may support the adequacy of the mapping. Divergence may indicate translation loss, distinct conditions of manifestation, an inadequate comparison domain, or genuinely different structures.

Cross-relational transformation therefore creates a testable relation among three terms:

$$x_a, \quad G_{ab}(x_a), \quad x_b.$$

4.2 Domains of Comparability

Comparability is generally domain-specific.

Let

$$D_{ab} = D_a \cap G_{ab}^{-1}(D_b)$$

denote the region in which the relevant structures from systems a and b can be meaningfully related.

The domain may concern a limited class of relations. Two systems may support comparison of temporal ordering while lacking a shared spatial representation. They may preserve causal dependence while organizing objects into different categories. They may support comparison at one scale and diverge at another.

The existence of a common domain should therefore be established for each comparison.

Cross-relational comparability is a local achievement whose scope must be specified together with the transformation that makes comparison possible.

This principle prevents a successful correspondence in one dimension from being generalized automatically to an entire relational system.

4.3 Types of Cross-Relational Transformation

Several transformation types are useful for the present framework.

A *representational transformation* relates different descriptions within sufficiently compatible symbolic or formal systems.

A *measurement transformation* relates outputs generated by different instruments, resolutions, calibration procedures, or observational practices.

A *conceptual transformation* establishes correspondences among categories whose boundaries and internal organizations differ.

A *functional transformation* compares roles or consequences within different relational configurations.

A *historical transformation* reconstructs correspondences between systems separated by temporal change.

A *cross-cognitive transformation* concerns the limiting case of systems whose perceptual or conceptual architectures may differ fundamentally.

These classes can overlap. A historical comparison may simultaneously require conceptual, linguistic, and measurement transformations.

A particular mapping can therefore be characterized through a transformation profile

$$\mathbf{G}_{ab} = (g_{ab}^R, g_{ab}^M, g_{ab}^C, g_{ab}^F, g_{ab}^H, g_{ab}^K), \quad (33)$$

where the components indicate the representational, measurement, conceptual, functional, historical, and cognitive dimensions involved in the comparison.

The profile is descriptive. It does not assume that each dimension can be quantified by a universal metric.

4.4 Partiality and Local Transformation

A transformation can remain valid within only part of a manifestation space.

Let

$$D_{ab}^{(1)}, D_{ab}^{(2)}, \dots, D_{ab}^{(n)}$$

denote locally comparable regions. Different transformations may be required for different regions:

$$G_{ab}^{(k)} : D_{ab}^{(k)} \longrightarrow \mathcal{X}_b.$$

This permits comparison without requiring a single global map.

Such locality is especially important when relational systems classify their domains differently. A concept that functions coherently in one region may split into several concepts in another. Conversely, several distinctions in system a may collapse into one category in system b .

The resulting mapping can therefore be many-to-one, one-to-many, or context-dependent.

Cross-relational analysis should preserve these local structures rather than forcing them into a globally uniform translation.

4.5 Asymmetry of Transformation

Cross-relational transformations may be asymmetric:

$$G_{ab} ; G_{ba}.$$

A meaningful transformation from a to b does not guarantee an equally informative reverse transformation.

The asymmetry can arise from differences in expressive resources, resolution, historical documentation, conceptual granularity, or available evidence.

For example, a high-resolution measurement system may be coarse-grained into a lower-resolution description with little difficulty, while reconstruction of the original fine structure from the coarse description may remain underdetermined.

Similarly, a concept in one language may be partially expressible through several terms in another, while reverse translation reconstructs only a subset of its original semantic organization.

The direction of transformation is therefore part of the epistemic specification:

$$(a \rightarrow b) \quad \text{and} \quad (b \rightarrow a)$$

represent distinct comparative operations.

4.6 Transformation Loss

A cross-relational transformation can preserve some structures while losing others.

Let

$$\Lambda_{ab}(x)$$

denote the information, relation, or distinction lost when x is mapped from $\mathcal{X}_a$ into $\mathcal{X}_b$.

The transformed form can be represented schematically as

$$G_{ab}(x_a) = \tilde{x}_b \quad \text{with} \quad \Lambda_{ab}(x_a). \tag{34}$$

The notation does not impose a numerical measure of loss. In some domains, loss may be quantifiable. In conceptual or historical comparison, it may require qualitative reconstruction.

Transformation loss matters because apparent invariance may be produced by discarding precisely those dimensions along which the systems differ.

A comparison that preserves only highly abstract structure can generate broad agreement while concealing substantial local variation.

The epistemic interpretation of an invariant must therefore be conditioned by the transformation through which it was obtained.

An invariant is only as informative as the transformation and comparison domain through which its persistence has been established.

4.7 Comparison Spaces

Direct translation between two manifestation spaces is not always the most appropriate strategy. Cross-relational comparison can instead proceed through a third space $\mathcal{Z}$:

$$I_a : \mathcal{X}_a \rightarrow \mathcal{Z}, \quad I_b : \mathcal{X}_b \rightarrow \mathcal{Z}.$$

The comparison space contains structures selected for the epistemic problem under investigation.

For example, two representations may differ completely in notation while supporting comparison of ordering relations. Two cultural classifications may differ in ontology while supporting comparison of functional dependence. Two physical models may use different variables while preserving a common observable quantity.

The construction of $\mathcal{Z}$ is itself an epistemic act.

Its dimensions, categories, and admissible relations are selected through a particular research problem. The comparison space therefore requires justification and remains revisable.

A common comparison space should not be mistaken for a neutral language already given independently of the systems compared.

4.8 Transformation Selection

Several possible transformations may connect the same two systems.

Let

$$\mathcal{G}_{ab} = \{G_{ab}^{(1)}, G_{ab}^{(2)}, \dots, G_{ab}^{(m)}\}$$

denote a family of candidate mappings.

Different mappings may preserve different structures.

The choice among them depends upon the epistemic purpose, evidence, domain, scale, and transformation criteria.

A justified transformation should specify at least:

$$(D_{ab}, P_{ab}, \Lambda_{ab}, E_{ab}),$$

where D_{ab} is the comparison domain, P_{ab} the structures intended to be preserved, Λ_{ab} the relevant loss, and E_{ab} the evidential basis supporting the mapping.

This specification makes transformation selection open to criticism.

It also prevents invariance from becoming circular. A transformation should not be chosen solely because it produces the invariant that the analysis already expects to find.

4.9 Composition of Transformations

When three relational systems are available, transformation paths can be compared.

Suppose

$$G_{ab}, \quad G_{bc}, \quad G_{ac}$$

are defined on appropriate domains.

A useful consistency question is whether

$$G_{ac}(x) \approx G_{bc} \circ G_{ab}(x) \tag{35}$$

for the structures under investigation.

Exact equality should not be presumed because each transformation can involve different losses and approximations.

Agreement between direct and composed transformations strengthens confidence that the correspondence is not dependent upon a single translation path.

Disagreement is equally informative. It may reveal hidden assumptions, path-dependent loss, incompatible comparison spaces, or relational structure that cannot be preserved through composition.

This yields a further object of inquiry:

transformation-path dependence.

Cross-relational comparison therefore concerns both mappings and the networks formed among mappings.

4.10 Transformation Networks

For multiple relational systems, pairwise comparison naturally produces a network.

Let

$$\mathcal{A} = \{a_1, a_2, \dots, a_n\}$$

denote a set of relational systems.

A transformation network can be represented as

$$\mathcal{N}_G = (\mathcal{A}, \mathcal{E}_G),$$

where an edge

$$(a_i, a_j) \in \mathcal{E}_G$$

indicates that a justified transformation exists over some specified domain.

The topology of this network matters.

Some systems may be directly comparable. Others may be accessible only through intermediate systems. Certain manifestation spaces may remain isolated for particular questions.

The absence of a transformation edge is itself epistemically meaningful. It identifies a current boundary of comparability rather than an empty result.

A later discovery of a new mapping can alter the transformation network and thereby create new opportunities for identifying invariants.

4.11 Equivalence and Correspondence

Cross-relational correspondence should remain distinct from equivalence.

A transformation may establish that two manifestations preserve a selected relation:

$$I_a(x_a) = I_b(x_b).$$

This provides equivalence with respect to the selected invariant I .

It does not establish unrestricted equivalence between x_a and x_b .

The relevant relation is therefore indexed:

$$x_a \sim_I x_b,$$

meaning that the manifestations are equivalent with respect to the specified structure I .

Other structures may remain different:

$$J_a(x_a) \neq J_b(x_b).$$

Cross-relational equivalence is consequently multidimensional and criterion-dependent.

This distinction becomes particularly important in comparative philosophy, religious studies, and cross-cultural analysis, where structural correspondence can coexist with profound differences in local meaning, history, ontology, and practice.

4.12 Failure of Transformation

The absence or failure of a transformation is an epistemic result.

A proposed mapping may fail because the comparison domain is too broad, the available evidence is insufficient, the systems organize their domains in incompatible ways, or the presumed common structure disappears under closer analysis.

Let

$$G_{ab} : D_{ab} \nrightarrow \mathcal{X}_b$$

denote a failed attempted transformation over the proposed domain.

Such failure can have several interpretations.

It may motivate restriction of the domain:

$$D_{ab} \longrightarrow D'_{ab}.$$

It may require construction of another comparison space.

It may reveal that a category previously treated as universal belongs only to one manifestation system.

It may also indicate that two systems genuinely organize the relevant phenomena through structures lacking an available correspondence.

Cross-relational epistemology therefore treats incomparability as a source of knowledge about the limits of its own categories.

4.13 Historical Reconstruction as Transformation

Historical interpretation provides a particularly important class of cross-relational transformation.

A historical conceptual system $\mathcal{X}_{a,t_1}$ is generally reconstructed through resources available at a later time t_2 .

The reconstruction can be represented as

$$G_{t_1 t_2} : \mathcal{X}_{a,t_1} \longrightarrow \tilde{\mathcal{X}}_{a,t_1}^{(t_2)}, \quad (36)$$

where the right-hand side denotes the earlier system as reconstructed under later epistemic conditions.

The reconstructed system is therefore historically double-situated. It is conditioned by the original historical configuration and by the later conditions under which reconstruction occurs.

This is especially relevant when comparing ancient cosmologies, religious concepts, legal categories, or philosophical vocabularies with contemporary analytical frameworks.

A term such as *Dao*, *śūnyatā*, or another historically situated concept cannot simply be inserted into a contemporary comparison space without specifying the transformation through which that insertion occurs.

The transformation itself becomes part of the analysis.

4.14 Observer-Mediated Transformation

Cross-relational mappings are constructed from an epistemic position.

Let

$$O_{c,u}$$

denote the observer or research system constructing a transformation between systems a and b .

The mapping is therefore more precisely represented as

$$G_{ab}^{(c,u)} : D_{ab} \longrightarrow \mathcal{X}_b. \quad (37)$$

The superscript records that the transformation itself arises under conditions belonging to a third relational position.

Different researchers or research traditions may therefore construct different transformations:

$$G_{ab}^{(c,u)} \neq G_{ab}^{(d,v)}.$$

Comparison among these transformations becomes another layer of cross-relational inquiry.

This reflexive extension prevents the analyst from occupying an implicit view from nowhere.

4.15 Generative Effects of Transformation

A transformation can also alter the systems it connects.

Translation introduces new vocabulary. Measurement calibration can reorganize experimental practice. Comparative categories can influence how communities describe themselves. Historical reconstruction can alter contemporary interpretations of inherited traditions.

A cross-relational mapping can therefore enter later relational dynamics:

$$G_{ab,t} \rightsquigarrow \mathfrak{R}_{a,t+1}, \mathfrak{R}_{b,t+1}. \quad (38)$$

Subsequent manifestations may then arise under conditions already modified by the earlier comparison.

This introduces a recursive structure:

$$\text{comparison} \rightarrow \text{transformation of systems} \rightarrow \text{new manifestations} \rightarrow \text{new comparison}.$$

Cross-relational transformations therefore possess histories of their own.

4.16 Architecture of Cross-Relational Transformation

The architecture developed in this section can be summarized through four components.

Relational systems generate heterogeneous manifestations:

$$x_a \in \mathcal{X}_a, \quad x_b \in \mathcal{X}_b.$$

A justified mapping is constructed over a restricted domain:

$$G_{ab} : D_{ab} \subseteq \mathcal{X}_a \longrightarrow \mathcal{X}_b.$$

The transformation generates an image

$$\tilde{x}_b = G_{ab}(x_a),$$

which can be compared with the manifestation independently available in system b .

Selected structures may then be reconstructed within a common comparison space:

$$I_a : \mathcal{X}_a \rightarrow \mathcal{Z}, \quad I_b : \mathcal{X}_b \rightarrow \mathcal{Z}.$$

The transformation itself must therefore be evaluated through its domain, direction, loss, evidential basis, comparison space, and historical position.

Cross-relational transformation is the epistemic infrastructure through which heterogeneous manifestations become comparable; invariance can be evaluated only after that infrastructure has been made explicit.

The next section develops the structures that remain stable under such transformations and distinguishes several forms of cross-relational invariance.

5 Cross-Relational Invariance

This section defines cross-relational invariance and distinguishes several forms that can arise under heterogeneous relational transformations. The central object is a structure that remains stable when manifestations produced under different conditions of access are related through a justified transformation.

The framework begins with two manifestation spaces $\mathcal{X}_a$ and $\mathcal{X}_b$, a partial transformation

$$G_{ab} : D_{ab} \subseteq \mathcal{X}_a \longrightarrow \mathcal{X}_b,$$

and relationally situated mappings

$$I_a : \mathcal{X}_a \rightarrow \mathcal{Z}, \quad I_b : \mathcal{X}_b \rightarrow \mathcal{Z},$$

into a comparison space $\mathcal{Z}$.

A candidate invariant satisfies

$$I_b \circ G_{ab} = I_a \tag{39}$$

over the relevant comparison domain.

Equation 39 expresses preservation across relational transformation. The manifestations themselves may remain substantially different:

$$x_a \neq x_b, \quad I_a(x_a) = I_b(x_b).$$

The epistemological importance therefore lies in structural persistence across difference.

5.1 Definition of Cross-Relational Invariance

Definition 5.1 (Cross-relational invariance). Let $\mathcal{X}_a$ and $\mathcal{X}_b$ be manifestation spaces generated under relational conditions $\mathcal{C}_a$ and $\mathcal{C}_b$. Let G_{ab} be a justified transformation over a domain $D_{ab} \subseteq \mathcal{X}_a$, and let I_a and I_b map the relevant structures into a comparison space $\mathcal{Z}$. A structure is cross-relationally invariant with respect to G_{ab} when the corresponding structure is preserved under that transformation.

The definition is transformation-relative and domain-relative. Cross-relational invariance therefore carries an implicit specification:

$$\text{Inv} (I; G_{ab}, D_{ab}, \mathcal{Z}) .$$

This specification matters because the same manifestations may exhibit invariance under one comparison and variation under another.

Cross-relational invariance is consequently a relational property of a comparison architecture rather than an unqualified property attached to an isolated object.

5.2 Invariant Structure and Manifestational Difference

An invariant need not preserve the complete form of a manifestation.

Suppose

$$x_a = (u_a, v_a, w_a)$$

and

$$x_b = (u_b, v_b, w_b) .$$

A transformation may preserve a relation involving u and v while allowing w to change substantially.

The invariant therefore concerns selected structure:

$$I_a(x_a) = I_b(x_b),$$

while much of the original manifestation remains system-specific.

This distinction prevents cross-relational invariance from collapsing into representational identity.

An invariant records what survives a specified relational transformation; the remaining difference records what the transformation does not preserve.

Both persistence and difference are epistemically informative.

5.3 Exact Invariance

Exact invariance occurs when the relevant structure is preserved without residual difference within the comparison space:

$$I_a(x_a) = I_b(G_{ab}(x_a)) . \tag{40}$$

Exact invariance is most natural in formal domains where the transformation and comparison structure can be specified precisely.

Examples may include coordinate-invariant relations, conserved mathematical structures, or formally equivalent constructions.

The existence of exact invariance within one domain does not imply that the entire manifestation is invariant. It establishes preservation only for the specified structure I .

5.4 Approximate Invariance

Many empirical and historical comparisons permit only approximate preservation.

Where a justified metric

$$d_Z$$

exists in the comparison space, approximate invariance can be represented as

$$d_Z(I_a(x_a), I_b(G_{ab}(x_a))) \leq \varepsilon. \quad (41)$$

The tolerance ε must be justified within the domain under investigation.

Its meaning may depend upon measurement uncertainty, model approximation, historical reconstruction, scale, or the practical purpose of comparison.

Approximate invariance therefore carries an explicit epistemic burden:

$$\varepsilon = \varepsilon(D, \sigma, E, P, \dots),$$

where the relevant factors can include domain, scale, evidence, and purpose.

No universal tolerance is assumed.

5.5 Local Invariance

A structure may remain invariant only within a restricted region of the comparison domain.

Let

$$U \subseteq D_{ab}.$$

Then invariance may hold for

$$x \in U$$

while failing outside that region.

This yields local cross-relational invariance:

$$I_b \circ G_{ab} = I_a \quad \text{on } U.$$

Locality can arise because the transformation itself is locally valid, because the compared systems diverge outside a particular range, or because the relevant structure changes after a critical transition.

This form is important for complex systems whose dynamics vary across regimes.

A relation may be invariant near one attractor, within one institutional configuration, or across a limited historical period while changing elsewhere.

5.6 Scale-Dependent Invariance

A candidate invariant can depend upon the scale at which a relational system is observed.

Let

$$\sigma_a \quad \text{and} \quad \sigma_b$$

denote scales of manifestation.

An invariant identified at one scale may disappear after coarse-graining or after transition to a finer level of description.

A scale-indexed invariant can therefore be written as

$$I^{(\sigma)}.$$

The corresponding comparison asks whether

$$I_a^{(\sigma_a)}(x_a) \approx I_b^{(\sigma_b)}(x_b)$$

after a justified relation between the scales has been established.

Scale dependence is particularly important when apparently stable entities are generated through rapidly changing lower-level relations.

A corporation, organism, institution, or social identity may possess persistent structure at one scale while exhibiting substantial internal variation at another.

Cross-relational invariance should therefore state the scale over which the preservation claim applies.

5.7 Temporal Invariance

Relational systems also change through time.

Within one broad system a , manifestations may evolve as

$$x_{a,t_1} \longrightarrow x_{a,t_2}.$$

A structure is temporally invariant over the interval under consideration when its relevant relation persists despite this evolution.

Temporal invariance can be represented as

$$I_{a,t_1}(x_{a,t_1}) = I_{a,t_2}(x_{a,t_2}),$$

subject to a justified temporal transformation between the two manifestation conditions.

Temporal persistence is especially important for distinguishing an invariant from a short-lived regularity.

The relevant horizon must remain explicit. A structure can be stable over seconds, generations, centuries, or geological timescales while changing over another horizon.

5.8 Historical Cross-Relational Invariance

Historical invariance combines changes in time with changes in epistemic conditions.

Suppose

$$\mathcal{C}_{a,t_1} \neq \mathcal{C}_{a,t_2}.$$

The later system may possess different concepts, instruments, institutions, languages, or archival resources.

A candidate structure that remains reconstructible across such historical variation has survived more than simple temporal persistence. It has survived a transformation in the conditions through which the domain becomes epistemically accessible.

This form can be represented schematically as

$$I_{a,t_1} \sim I_{a,t_2},$$

where the relation $\sim$ is established through an explicit historical reconstruction.

Historical invariance can therefore support inquiry into continuity across scientific revolutions, legal change, religious transformation, economic systems, or evolving symbolic grammars.

The comparison must preserve the distinction between historical continuity and retrospective projection.

5.9 Cross-Cognitive Invariance

The limiting case concerns relational systems with substantially different cognitive architectures.

Let systems a and b differ in perception, embodiment, temporal resolution, symbolic organization, or primitive conceptual distinctions.

A structure that remains comparable under such variation would constitute a strong form of cross-relational invariance.

The hypothetical comparison can be represented as

$$\mathcal{C}_a^{\text{human}} ; \mathcal{C}_b^{\text{nonhuman}},$$

with candidate invariance evaluated only after a justified transformation between their manifestation spaces has been constructed.

The significance of this limiting case lies in its capacity to expose hidden anthropocentric assumptions.

A structure that survives variation in uniquely human conditions of access provides stronger grounds for treating that structure as independent of those particular conditions.

The claim remains epistemic. It does not establish that the structure exhausts the ontology of reality.

5.10 Invariant Relations and Invariant Entities

Cross-relational invariance may preserve relations even when entities change.

Suppose two manifestation systems identify different objects:

$$\{A_1, A_2, A_3\} \quad \text{and} \quad \{B_1, B_2\}.$$

A direct entity correspondence may be unavailable.

A relational pattern can nevertheless survive:

$$R_A(A_i, A_j) \sim R_B(B_k, B_l).$$

This distinction is especially important for GR because entities can function as historically and analytically stabilized forms.

A candidate invariant may therefore concern:

entity identity, relation, ordering, dependency, transition, constraint, topology, generative rule.

The persistence of relational structure can remain epistemically significant even when the entities through which that structure is represented differ.

This possibility connects cross-relational invariance with structural realist intuitions while preserving GR's stronger emphasis on historically generated manifestations.

5.11 Invariant Functions

Some cross-relational comparisons preserve function more readily than form.

Two systems may employ different entities, symbols, or institutional arrangements while preserving a comparable relational role.

Let

$$F_a(x_a) \quad \text{and} \quad F_b(x_b)$$

denote functions within their respective systems.

Functional invariance concerns a justified correspondence

$$F_a(x_a) \sim F_b(x_b).$$

This mode of comparison can be useful in political economy, comparative religion, biology, and institutional analysis.

For example, different monetary forms can preserve some functions of settlement or value transfer while differing substantially in carrier, institutional organization, and legal structure.

Likewise, different religious configurations can distribute normative, sacred, or orienting functions across different entities and processes.

Functional invariance should remain distinct from theological, ontological, or historical equivalence.

5.12 Invariant Generative Structure

GR gives particular importance to structures governing generation and transition.

Suppose two manifestation systems represent becoming through different symbolic grammars:

$$\Sigma_a \neq \Sigma_b.$$

Their specific representations may diverge while preserving a generative relation such as dependency, recurrence, coupling, branching, or path-dependent transition.

A generative invariant can therefore concern the structure of

$$x_t \rightsquigarrow x_{t+1}$$

rather than the identity of any individual state.

This becomes especially important for later comparison of heterogeneous accounts of change.

A Daoist grammar of transformation, a modern dynamical model, and a hypothetical non-human system need not share symbols, ontology, or explanatory vocabulary for a limited generative structure to become comparable.

Whether such a structure actually exists must be established through the cross-relational analysis itself.

5.13 Families of Invariants

A manifestation pair may support more than one invariant.

Let

$$\mathcal{I}_{ab} = \{I_{ab}^{(1)}, I_{ab}^{(2)}, \dots, I_{ab}^{(n)}\}$$

denote the family of structures preserved across a specified comparison.

Different members of the family may have different domains and degrees of robustness.

For example, one relation may be exactly invariant, another approximately invariant, and another invariant only at a particular scale.

The epistemic profile of a comparison is therefore better represented by an invariant family than by a single universal invariant.

The family can itself change as new transformations become available:

$$\mathcal{I}_{ab}^{(t)} \longrightarrow \mathcal{I}_{ab}^{(t+1)}.$$

This provides a formal expression of the revisability already introduced in the Discussion Paper Note.

5.14 Network Invariance

When several relational systems are compared, an invariant may persist across a transformation network rather than only across one pair.

Let

$$\mathcal{A} = \{a_1, \dots, a_n\}$$

denote the systems included in the comparison.

A candidate invariant can then be evaluated across the relevant edges of the transformation network:

$$I_{a_i}(x_{a_i}) \sim I_{a_j}(x_{a_j}).$$

The resulting structure may persist across a connected subset of systems while failing elsewhere. This yields a domain of invariant support:

$$\mathcal{A}_I \subseteq \mathcal{A}.$$

The size of $\mathcal{A}_I$ alone does not determine epistemic strength. The relational heterogeneity among its members also matters.

A network containing many nearly identical systems may provide less independent support than a smaller network containing strongly heterogeneous modes of access.

The epistemic interpretation of this heterogeneity will be developed in Section 7.

5.15 Path Independence and Invariant Stability

Transformation networks permit a further test.

Suppose a structure can be transported from system a to system c either directly or through an intermediate system b .

The two paths are

$$G_{ac}$$

and

$$G_{bc} \circ G_{ab}.$$

If the candidate invariant is preserved under both paths, then

$$I_c \circ G_{ac} \approx I_c \circ G_{bc} \circ G_{ab}$$

on the relevant domain.

Agreement across transformation paths strengthens confidence that the identified structure does not depend entirely upon one particular translation route.

Path dependence, by contrast, can reveal accumulated transformation loss, hidden assumptions, or structures whose preservation depends upon the route through which comparison is performed.

Thus invariance itself can possess a higher-order robustness under variation of transformation path.

5.16 Failure of Invariance

Cross-relational analysis gives equal importance to structures that fail to survive transformation.

Suppose

$$I_a(x_a) \neq I_b(G_{ab}(x_a)).$$

Several interpretations are possible.

The transformation may be inadequate.

The comparison domain may be too broad.

The structure may depend upon conditions specific to system a .

The manifestation independently generated by system b may disclose a different organization of the relevant domain.

A previously assumed universal may therefore become recognizable as a local relational form.

Failure of invariance can reveal the relational conditions upon which an apparently general category depends.

For GR, such failure is theoretically productive because it can force revision of the categories used for comparison.

5.17 Invariance and Loss

An invariant must also be interpreted together with transformation loss.

A highly abstract comparison may preserve one simple relation by removing many dimensions of local structure.

Suppose

$$G_{ab}$$

produces substantial loss Λ_{ab} .

An invariant discovered after this transformation remains valid with respect to the retained structure, while its epistemic interpretation must reflect the information removed by the mapping.

Two manifestations can therefore appear highly invariant at a coarse level and highly heterogeneous at a richer level of description.

This creates a trade-off between abstraction and local fidelity.

Cross-relational analysis should consequently report both

$$\mathcal{I}_{ab}$$

and

$$\Lambda_{ab}$$

when the latter can be meaningfully characterized.

5.18 Comparison-Space Dependence

Invariance also depends upon the construction of the comparison space $\mathcal{Z}$.

Different comparison spaces can expose different persistent structures:

$$\mathcal{Z}_1 ; \mathcal{Z}_2 ; \mathcal{Z}_3.$$

A political-economic comparison organized around exchange may identify one set of invariants, while a comparison organized around legal authority or material reproduction may identify another.

A comparative religious analysis organized around subjecthood may preserve different structures from one organized around ritual function or soteriological orientation.

The comparison space therefore participates in the production of the invariant.

This does not make invariance arbitrary. It means that the epistemic claim must specify the question through which preservation becomes relevant.

5.19 Invariance under Relevant Variation

The concept of invariance becomes epistemically useful only when the transformation varies conditions relevant to the structure under investigation.

A structure preserved while an irrelevant feature changes provides limited information about its independence from the conditions of manifestation.

By contrast, preservation under transformations that alter plausible sources of the structure provides a stronger test.

The distinction can be stated succinctly:

The significance of an invariant depends upon the relevance of the variation under which it persists.

This principle prepares the transition from invariance as a formal property to invariance as an epistemological resource.

5.20 Cross-Relational Invariance as a Revisable Structure

An invariant identified at one stage of inquiry remains open to later transformation.

New instruments may expose previously invisible variation.

New historical evidence may alter the reconstruction map.

New conceptual systems may enlarge the comparison space.

New relational systems may introduce forms of access absent from the original analysis.

The invariant family therefore evolves:

$$\mathcal{I}_t \longrightarrow \mathcal{I}_{t+1}. \tag{42}$$

Possible outcomes include preservation, restriction, refinement, decomposition, and dissolution.

A historical invariant can therefore remain epistemically significant even when later inquiry narrows its domain.

Revisability concerns the scope and interpretation of the claim rather than a requirement that every previous invariant disappear.

5.21 Architecture of Cross-Relational Invariance

The architecture developed in this section can be summarized through a sequence of relational operations.

Heterogeneous manifestation spaces are generated under different conditions:

$$x_a \in \mathcal{X}_a, \quad x_b \in \mathcal{X}_b.$$

A justified transformation establishes a comparison domain:

$$G_{ab} : D_{ab} \longrightarrow \mathcal{X}_b.$$

Structures are extracted into a comparison space:

$$I_a : \mathcal{X}_a \rightarrow \mathcal{Z}, \quad I_b : \mathcal{X}_b \rightarrow \mathcal{Z}.$$

Cross-relational invariance is then identified through preservation:

$$I_b \circ G_{ab} = I_a.$$

The resulting invariant remains indexed by its transformation, domain, scale, comparison space, historical conditions, and known transformation loss.

It may be exact or approximate, local or extended, scale-dependent or cross-scale, temporally persistent, historically reconstructed, functional, relational, generative, or distributed across a network of systems.

Cross-relational invariance identifies structure that survives specified changes in the relations of access while preserving explicit knowledge of the conditions under which that survival was established.

The concept now has a formal meaning. The next question is more demanding: what relation, if any, does such invariance bear to symmetry in the stronger mathematical, physical, and ontological senses? The next section develops this question through the gauge analogy and its limits.

6 Symmetry, Gauge Reasoning, and Cross-Relational Invariance

This section examines the relation between cross-relational invariance and symmetry. Symmetry provides a powerful formal model for distinguishing variation in representation from preservation of structure, and gauge theory offers an especially important case in which mathematically different descriptions can correspond to the same physical situation. These resources clarify the present framework, but their extension beyond formal physical theories requires explicit limits.

The central distinction developed here is among symmetry defined within a formal representational system, invariance identified across heterogeneous relational systems, and symmetry attributed to reality independently of those systems:

$$\text{Sym}_{\text{rep}} ; \text{Inv}_{\text{cross}} ; \text{Sym}_{\text{ont}}.$$

The first is formally definable when the relevant mathematical structure is available. The second is the principal object developed in this paper. The third introduces a further ontological interpretation whose epistemic warrant must be assessed separately.

6.1 Transformation and Symmetry

In its general mathematical form, symmetry concerns transformations that preserve specified structure. Let a transformation g act upon an object or state x . A quantity or structure I is invariant under the transformation when

$$I(gx) = I(x). \quad (43)$$

The transformation can alter the representation while leaving the selected structure unchanged. For a family of transformations $\mathcal{G}$, one may consider

$$g \in \mathcal{G}$$

and ask which properties remain invariant for all relevant g .

The epistemological importance of this structure lies in the separation between what changes and what survives. Variation becomes informative because it reveals which aspects of a description depend upon the chosen representation and which persist through transformations of that representation.

Weyl's treatment of symmetry gave this idea a broad mathematical and philosophical significance, connecting transformations and invariant structure across geometry and physics [9].

6.2 Gauge Transformations and Representational Freedom

Gauge theories provide a particularly strong realization of this logic. Within a gauge-theoretic formulation, multiple mathematical configurations may belong to a common gauge orbit and represent the same physical situation under the interpretation supplied by the theory.

If a group $\mathcal{G}$ acts upon a configuration space $\mathcal{X}$, the orbit of x is

$$[x]_{\mathcal{G}} = \{gx : g \in \mathcal{G}\}. \quad (44)$$

A gauge-invariant quantity takes the same value throughout the orbit:

$$I(gx) = I(x).$$

The physical interpretation of gauge freedom is a substantial philosophical topic in its own right. The present paper requires only a narrower lesson: different mathematical descriptions can encode representational variation while preserving structures treated as physically significant within a theory [2].

This provides a disciplined example of

variation in description with preservation of selected structure.

That relationship motivates the comparison with cross-relational invariance.

6.3 Cross-Relational Transformation and Gauge-Like Reasoning

Cross-relational comparison has a superficially similar architecture.

Two systems may produce distinct manifestations

$$x_a \in \mathcal{X}_a, \quad x_b \in \mathcal{X}_b,$$

while a justified transformation

$$G_{ab} : D_{ab} \rightarrow \mathcal{X}_b$$

permits comparison between them.

A structure may then satisfy

$$I_b \circ G_{ab} = I_a.$$

The analogy with symmetry is clear. Relational manifestation changes while a selected structure survives.

The analogy is nevertheless limited. In the general cross-relational case, G_{ab} need not belong to a transformation group. The spaces $\mathcal{X}_a$ and $\mathcal{X}_b$ may themselves differ. The mapping can be partial, historically reconstructed, asymmetric, approximate, or lossy.

Accordingly, cross-relational invariance should be described as *gauge-like* only in the methodological sense of variation accompanied by structural preservation.

Gauge reasoning supplies a model for separating transformation-dependent form from transformation-resistant structure. Cross-relational invariance extends this question to cases in which the systems of manifestation themselves may be heterogeneous.

6.4 Absence of Presumed Group Structure

The absence of a presumed group structure marks one of the most important differences between gauge symmetry and cross-relational transformation.

A mathematical group requires closure, associativity, an identity element, and inverses. Cross-relational mappings need not satisfy these conditions.

A transformation

$$G_{ab}$$

may exist while no meaningful inverse

$$G_{ba} = G_{ab}^{-1}$$

can be constructed.

Similarly, composition may be approximate:

$$G_{ac} \approx G_{bc} \circ G_{ab},$$

or may fail because one of the intermediate mappings discards distinctions required by the next.

Cross-relational transformation therefore cannot generally be represented as a group action on a common state space.

This limitation is conceptually productive. It allows the framework to retain historical irreversibility, semantic loss, differences in scale, and asymmetries of cognitive or representational capacity.

The formal elegance of gauge symmetry should therefore not be purchased at the cost of suppressing the heterogeneity that motivates the cross-relational problem.

6.5 Equivalence Classes and Relational Correspondence

Gauge transformations naturally generate equivalence classes such as $[x]_{\mathcal{G}}$. Cross-relational comparison generally supports a weaker relation.

If two manifestations preserve a specified structure I , one may write

$$x_a \sim_I x_b.$$

This expression means only that the manifestations correspond with respect to I .

Another structure J may remain different:

$$J_a(x_a) \neq J_b(x_b).$$

Cross-relational equivalence is therefore indexed by the structure under comparison.

A single pair of manifestations can simultaneously satisfy

$$x_a \sim_{I_1} x_b$$

and fail to satisfy

$$x_a \sim_{I_2} x_b.$$

This prevents the language of equivalence from erasing meaningful manifestational differences.

It is particularly important when comparing philosophical, cultural, or religious systems. Structural correspondence in one dimension does not establish equivalence of ontology, practice, history, meaning, or value.

6.6 Symmetry of Representation

The first level of the paper's symmetry question concerns representation.

Suppose a manifestation x supports several representations:

$$x \rightsquigarrow \{r^{(1)}, r^{(2)}, \dots, r^{(n)}\}.$$

Transformations among these representations may preserve some structure:

$$r^{(i)} \xrightarrow{g_{ij}} r^{(j)}.$$

When the transformations possess a specified formal structure, ordinary symmetry analysis can determine which quantities remain invariant.

This is the least metaphysically demanding form of symmetry considered in the paper.

It concerns the organization of representation rather than the ultimate constitution of reality.

A representational symmetry can therefore be real as a property of a formal system even if its ontological interpretation remains unsettled.

6.7 Symmetry of Relational Reality

The second level concerns relational reality.

A relationally real form participates in generative dynamics:

$$\mathfrak{R}_t \rightsquigarrow X_t^{\text{rel}} \rightsquigarrow \mathfrak{R}_{t+1}.$$

One can therefore ask whether transformations of the relational configuration preserve some generative structure.

For example, different carriers may reproduce a comparable social function. Different institutional arrangements may preserve a dependency relation. Different symbolic manifestations may sustain a similar generative cycle.

The relevant invariant need not concern the identity of X_t . It may concern the structure through which X_t participates in subsequent generation.

This suggests a relational symmetry question of the form:

$$I(\mathfrak{R}_t) = I(G\mathfrak{R}_t).$$

The interpretation remains domain-specific. A transformation of a social, historical, or religious relational system is generally different from a symmetry transformation in physics.

The common epistemic idea is preservation of structure through specified variation.

6.8 Symmetry of Epistemically Accessible Reality

The third practically accessible problem concerns $\mathfrak{R}^{\text{epi}}$.

Different epistemic systems may manifest a possible domain through different conditions:

$$x_a = \mathcal{M}_a(X^*; \mathcal{C}_a),$$

$$x_b = \mathcal{M}_b(X^*; \mathcal{C}_b).$$

Cross-relational invariance asks whether some structure persists despite variation in $\mathcal{C}_a$ and $\mathcal{C}_b$.

If such persistence is found, then the invariant appears less dependent upon the specific access conditions that differ between the two systems.

This is the principal epistemological use of symmetry in the present paper.

The more relevant conditions of manifestation can vary while a structure persists, the stronger the reason for treating that structure as exceeding the peculiarities of any one manifestation system.

The conclusion concerns epistemic robustness. Its ontological interpretation requires a further step.

6.9 Ontological Symmetry

The strongest version of the title question concerns $\mathfrak{R}^{\text{ont}}$.

Suppose a structure I survives comparison across several heterogeneous relational systems:

$$I_a(x_a) = I_b(x_b) = I_c(x_c).$$

One might be tempted to conclude that reality itself possesses the corresponding symmetry. That inference is underdetermined.

The observed invariance may reflect structure associated with the possible ontological referent. It may also reflect conditions shared by the compared systems, common measurement constraints, common modes of abstraction, convergent representational strategies, or a comparison space designed to preserve the structure.

The ontological question therefore remains:

$$\text{Inv}_{\text{cross}}(I) \quad \xrightarrow{?} \quad \text{Sym}_{\text{ont}}(I).$$

No general implication is assumed.

Cross-relational invariance can make an ontological interpretation more interesting and, under appropriate conditions, more credible. It does not convert epistemic persistence into metaphysical proof.

This distinction gives the subtitle its open character.

6.10 Shared Constraints and Apparent Symmetry

A recurrent source of epistemic overreach is shared constraint.

Suppose relational systems a and b differ in several respects while retaining an important common condition C :

$$C \in \mathcal{C}_a \cap \mathcal{C}_b.$$

An invariant may then arise because both manifestations remain conditioned by C .

Human observers provide an obvious case. Individuals may differ culturally, linguistically, historically, and theoretically while sharing major features of embodiment, sensory architecture, cognitive limitation, and spatial or temporal scale.

Agreement across such observers can therefore leave some anthropocentric conditions untested.

The same problem arises in scientific instrumentation. Multiple experiments may appear independent while sharing calibration standards, statistical assumptions, software pipelines, theoretical background, or technological architecture.

Observed invariance must consequently be interpreted together with the structure of shared conditions.

6.11 Invariant Error

The preceding problem leads to an important possibility: *error can itself be invariant*.

Suppose several systems share a distortion operator D :

$$x_a = D(y_a), \quad x_b = D(y_b).$$

A property introduced by D may survive comparison across the systems.

The resulting persistence is real at the level of the manifestations but misleading if interpreted as evidence for a corresponding structure in the domain being investigated.

This possibility prevents invariance from functioning as a sufficient criterion of truth.

The epistemological task must therefore consider both

what remains invariant

and

which conditions also remained invariant.

The second question is indispensable.

6.12 Broken Symmetry and Manifestational Differentiation

Symmetry also becomes relevant through its failure.

A system may admit a symmetric space of possibilities while historical, material, or dynamical processes produce an asymmetric realization.

In formal physics, spontaneous symmetry breaking provides precise examples of this general pattern. The present paper does not transfer that formal mechanism directly into social or epistemic domains. It draws attention to a more general distinction between symmetry of possibilities and asymmetry of manifestation.

Relational manifestations can differ even where some generative structure is shared:

$$I_a(x_a) = I_b(x_b), \quad x_a \neq x_b.$$

The difference may therefore be part of the realization of the system rather than evidence against every deeper structural correspondence.

Conversely, visible regularity among manifestations does not establish an underlying ontological symmetry.

The direction of inference must remain open in both cases.

6.13 Symmetry and Generativity

GR introduces an additional question concerning generation.

A symmetry can describe structures preserved under transformation, while generativity concerns how new states, forms, or relations arise.

The two concepts therefore address different dimensions of a dynamical system:

transformation-resistant structure ; state-generating process.

Their interaction is theoretically important.

A generative process may preserve an invariant:

$$x_t \rightsquigarrow x_{t+1}, \quad I(x_t) = I(x_{t+1}).$$

Another process may transform the invariant itself:

$$I_t \longrightarrow I_{t+1}.$$

GR therefore does not assume that invariance is timeless. It asks which structures persist over specified transformations and which transformations change the space of possible invariants.

This distinction becomes particularly important for historically evolving systems.

6.14 Symmetry of Generativity

The preceding distinction leads to a deeper question closely related to the Daoist case developed later in the paper.

Suppose two relational systems possess substantially different grammars for describing change:

$$\Sigma_a \neq \Sigma_b.$$

Their representations of particular states may differ, while some structure of generation remains comparable:

$$I_{\text{gen}}(\Sigma_a) \sim I_{\text{gen}}(\Sigma_b).$$

The candidate invariant may concern recurrence, dependency, coupling, transition, constraint, branching, or another generative relation.

This raises a stronger question:

Can the forms through which different systems understand generation vary while some structure of generativity remains invariant?

An affirmative answer would establish cross-relational invariance of a generative structure. It would still leave open whether that invariant expresses the structure of ontological reality itself.

This distinction will be central to the later comparison among historical, scientific, and hypothetical non-human grammars of becoming.

6.15 Relational Symmetry without Ontological Closure

The framework can now state its symmetry position more precisely.

Representational symmetry can be formally established within appropriately specified systems.

Cross-relational invariance can be investigated through justified mappings among heterogeneous manifestation spaces.

Relational symmetry can characterize structures that persist across transformations of generative configurations.

Ontological symmetry remains a further metaphysical interpretation.

These claims form an epistemic progression, not a deductive chain.

Symmetry becomes increasingly metaphysically demanding as inquiry moves from formal representation, through relational manifestation, toward claims about reality independently of every available mode of access.

The paper therefore permits increasingly strong evidence while preserving a boundary between evidence and ontological closure.

6.16 The Gauge Analogy as a Research Heuristic

The principal value of the gauge analogy is methodological.

It encourages inquiry to ask:

Which features of a manifestation change under a transformation?

Which features remain stable?

Which differences arise from representation?

Which differences reflect changes in the relational conditions of access?

Can apparently different manifestations be related through a justified transformation?

Does preservation survive alternative transformation paths?

What common constraints might explain the observed invariance?

These questions can be applied even where no literal gauge group exists.

The analogy therefore functions as a heuristic for constructing cross-relational comparisons while the formal status of each transformation must be determined independently.

6.17 Boundary of the Gauge Analogy

Several boundaries should remain explicit.

First, cross-relational systems need not share a common mathematical state space.

Second, transformations may be partial and non-invertible.

Third, semantic and historical loss may be intrinsic to comparison.

Fourth, cross-relational correspondence can depend upon an observer who constructs the mapping.

Fifth, the compared manifestations can participate in changing one another through the act of comparison.

Sixth, an identified invariant may itself be historically revisable.

These conditions differ substantially from the idealized structure of a gauge orbit within a formal physical theory.

Consequently, the language of gauge symmetry should be used literally only where the required mathematical structure has been demonstrated.

Elsewhere, gauge theory provides an analogy of transformation-sensitive description and transformation-resistant structure.

6.18 From Symmetry to Epistemic Robustness

The symmetry discussion now returns to the epistemological problem.

An invariant becomes epistemically informative when it survives transformations that vary conditions relevant to its appearance.

Its significance increases when alternative explanations based upon shared distortion, common representation, or common access conditions become less plausible.

The resulting epistemic movement can be stated compactly:

Symmetry supplies the logic of preservation under transformation; cross-relational analysis supplies the heterogeneity of the transformations; epistemic robustness concerns what confidence that preservation can support.

This movement does not answer the question *Does reality have symmetry?* in advance.

It specifies what evidence would make an affirmative answer increasingly credible and what limitations prevent such credibility from becoming automatic metaphysical certainty.

The next section develops this problem directly by examining epistemic robustness under relational variation.

7 Epistemic Robustness under Relational Variation

This section develops the epistemic significance of cross-relational invariance. The central problem concerns the transition from structural persistence to justified epistemic confidence. An invariant can remain stable across several manifestations while still reflecting shared constraints, common distortions, inherited assumptions, or the design of the comparison itself. Persistence therefore becomes epistemically informative only in relation to the variations under which it has been tested.

The present framework uses *epistemic robustness* for the support acquired by a candidate structure through survival across relevant and sufficiently independent variations in the conditions of relational access.

Robustness is therefore relationally indexed. It concerns a structure, a set of manifestation systems, a family of transformations, and a specified epistemic question.

7.1 From Invariance to Epistemic Robustness

Cross-relational invariance establishes that a selected structure survives a specified transformation:

$$I_b \circ G_{ab} = I_a.$$

This result alone does not determine how much epistemic confidence should be placed in I .

Suppose two observers employ nearly identical instruments, conceptual frameworks, calibration procedures, and background assumptions. Agreement between their manifestations may establish reproducibility within that configuration, while providing little information about dependence upon the shared conditions.

By contrast, persistence across substantially different relevant conditions can rule out a wider class of manifestation-specific explanations.

The epistemological movement can therefore be stated as follows:

Cross-relational invariance becomes epistemically robust when the structure persists through variations that would plausibly have altered it if its appearance depended primarily upon the conditions being varied.

The relevant issue is thus not the number of agreeing manifestations, but the structure of their heterogeneity.

7.2 Relevant Relational Variation

Variation contributes epistemic information only when it bears upon plausible sources of the candidate structure.

Let

$$\Delta\mathcal{C}_{ab}$$

denote the difference between the conditions of manifestation in systems a and b .

The epistemic significance of this difference depends upon the structure under investigation. Variation in language may be highly relevant to a linguistic classification and comparatively less relevant to a directly measured physical ratio. Variation in instrumentation may be decisive for an observational regularity. Variation in institutional organization may be critical for a social category.

Accordingly, GR distinguishes

$$\Delta\mathcal{C}_{ab}^{\text{rel}} \quad \text{and} \quad \Delta\mathcal{C}_{ab}^{\text{irr}},$$

where the superscripts indicate variations provisionally judged relevant or irrelevant to the production of the candidate invariant.

The distinction is itself revisable. A condition initially regarded as irrelevant may later prove to have participated in the observed structure.

Epistemic robustness therefore depends upon an explicit account of why the variation tested is relevant.

7.3 Heterogeneity and Epistemic Independence

Heterogeneity and independence are related but distinct.

Two systems can differ visibly while sharing the same underlying source of information. Conversely, two manifestations may appear similar while having been generated through substantially independent pathways.

Let

$$\mathcal{D}_{ab}$$

denote the dependency structure connecting the epistemic histories of systems a and b .

Strong dependence may arise through shared data, common instruments, copied models, inherited conceptual schemes, institutional coordination, common training, or a shared observational pipeline.

The epistemic value of agreement should therefore be evaluated together with the dependency structure of the manifestations.

A useful principle is:

Independent routes to a common structure generally provide stronger epistemic support than repeated derivations whose apparent plurality originates from a single epistemic pathway.

This principle applies both to ordinary scientific replication and to wider cross-relational comparison.

7.4 Shared Conditions and Residual Dependence

Even highly heterogeneous systems may retain common conditions.

Let

$$\mathcal{C}_{ab}^{\text{shared}} = \mathcal{C}_a \cap \mathcal{C}_b$$

denote the conditions that remain shared across a comparison.

The notation is schematic because many conditions cannot be represented as simple set elements. Its purpose is to identify the residual common structure that may continue to generate the observed invariant.

Human observers provide a particularly important example. Cultural, linguistic, and historical diversity can coexist with broadly shared bodily architecture, sensory ranges, temporal constraints, cognitive limitations, and forms of social learning.

A cross-cultural invariant may therefore survive substantial cultural variation while remaining conditioned by features common to human cognition.

This does not eliminate its epistemic value. It limits the scope of the independence established by the comparison.

The appropriate conclusion is therefore indexed to the variations actually tested.

7.5 Shared Distortion

A common condition can generate a common distortion.

Suppose manifestations are produced through

$$x_a = D(y_a), \quad x_b = D(y_b),$$

where D represents a shared distortion process.

If a structure introduced by D appears in both manifestations, it may survive cross-relational comparison even though it originates in the common access architecture.

The existence of an invariant therefore raises two separate questions:

What structure survives the transformation, and what conditions capable of producing that structure have themselves remained unchanged?

The second question prevents agreement from being interpreted too quickly as evidence for manifestation-independent reality.

Examples of shared distortion can include common instrument bias, inherited classification systems, common data sources, shared statistical assumptions, or biological constraints affecting all compared observers.

7.6 Invariant Error

The possibility of shared distortion implies the possibility of *invariant error*.

An error can survive several transformations if the transformations leave its generating condition intact.

Thus,

$$\text{Inv}_{\text{cross}}(I)$$

does not establish

$$\text{Truth}(I).$$

The epistemic role of invariance is evidential rather than criterial. Invariance changes the space of plausible explanations for a structure; it does not eliminate every alternative explanation automatically.

This distinction is central to the paper’s ontological restraint.

An invariant is epistemically significant because it has survived specified opportunities for failure. Its significance depends upon which opportunities for failure were actually created by the comparison.

This formulation makes robustness a property of testing history rather than a timeless label attached to a structure.

7.7 Robustness Profiles

A single scalar measure of epistemic robustness would conceal important differences among modes of relational variation.

The present framework therefore favors a multidimensional robustness profile.

For a candidate invariant I , let

$$\mathbf{E}_t(I) = (h_t, d_t, p_t, s_t, \tau_t, \lambda_t, q_t), \quad (45)$$

where the components provisionally represent:

- h_t : heterogeneity of relevant access conditions;
- d_t : independence of epistemic pathways;
- p_t : persistence across transformation paths;
- s_t : stability across scale;
- τ_t : temporal or historical persistence;
- λ_t : known transformation loss;
- q_t : quality and adequacy of the evidential basis.

The profile is conceptual rather than universally quantitative. Particular domains may operationalize some dimensions numerically and others qualitatively.

Its purpose is to prevent different forms of robustness from being collapsed into one undifferentiated notion of “agreement.”

7.8 Robustness across Transformation Paths

Section 5 introduced transformation-path dependence.

Suppose a structure can be compared through several paths:

$$a \rightarrow c, \quad a \rightarrow b \rightarrow c.$$

If the same candidate invariant survives both, its support becomes less dependent upon one particular transformation construction.

Path variation can therefore function as an additional epistemic test.

The important point is not that every path must yield an identical representation. The test concerns whether the selected structure remains stable after accounting for the distinct losses and transformations involved.

Disagreement across paths can reveal hidden assumptions in one of the mappings or indicate that the apparent invariant was produced by a particular translation procedure.

7.9 Robustness across Scale

Scale provides another dimension of epistemic variation.

A relation observed at one scale may disappear, reverse, or decompose at another. Conversely, a structure may persist across several scales despite substantial changes in the entities used to represent it.

Cross-scale robustness concerns this persistence.

Let

$$I^{(\sigma_1)}, I^{(\sigma_2)}, \dots$$

denote the candidate structure under different resolutions.

Cross-scale preservation does not require identical descriptions at each level. It requires a justified account of which structure is being tracked through the scale transformation.

Scale robustness is especially relevant to relational reality because many apparently stable forms emerge from rapidly changing lower-level dynamics.

The persistence of a social institution, biological organism, monetary system, or religious configuration may therefore depend upon invariants that exist only at particular levels of coarse-graining.

7.10 Historical Robustness

Historical variation offers another important test because both the object of inquiry and the means of access can change.

An invariant may survive changes in language, institutions, instruments, theories, archives, and practical purposes.

Such persistence can strengthen epistemic confidence that the structure is not an artifact of one historical configuration.

Historical persistence must nevertheless be distinguished from retrospective reconstruction.

Later observers can impose continuity through categories unavailable to earlier systems. A claimed historical invariant therefore depends upon the adequacy of the transformation through which earlier manifestations are reconstructed.

Historical robustness is strongest when continuity survives multiple independently justified reconstructions rather than one imposed analytical vocabulary.

7.11 Cross-Cultural Robustness

Cross-cultural comparison provides a particularly important form of relational variation.

Different communities may organize experience through distinct languages, symbolic systems, ontologies, institutions, practices, and historical memories. A structure that remains identifiable across these differences may have considerable epistemic significance.

The comparison must preserve the asymmetry between structural correspondence and conceptual equivalence.

A shared pattern such as dependency, reciprocity, temporal ordering, or relational differentiation may remain comparable even where its local interpretation differs substantially.

Cross-cultural robustness therefore concerns survival of a specified structure across cultural transformation, not reduction of heterogeneous traditions to a common vocabulary.

This principle will be important for the later Daoist and Buddhist cases.

7.12 Cross-Cognitive Robustness

The strongest limiting test considered in this paper concerns variation in cognitive architecture itself.

A hypothetical non-human intelligence may possess different sensory ranges, temporal resolution, symbolic capacities, embodiment, or primitive distinctions.

If a candidate structure remains reconstructible across such a comparison, then specifically human conditions of cognition have been varied more substantially than in ordinary inter-human comparison.

The epistemic implication is correspondingly stronger:

Persistence across heterogeneous cognitive architectures would provide evidence that a structure exceeds a wider range of observer-specific conditions, while still leaving open whether it belongs to reality independently of every possible form of access.

This thought experiment establishes a limit concept for epistemic robustness, not an empirical claim concerning actual extraterrestrial cognition.

7.13 Negative Robustness Tests

Robustness analysis should actively seek transformations under which a candidate invariant might fail.

An inquiry that selects only transformations already expected to preserve the structure risks producing confirmation by construction.

A stronger procedure deliberately varies conditions plausibly responsible for the invariant.

This can be represented as a family of challenges

$$\mathcal{T}_I = \{G^{(1)}, G^{(2)}, \dots, G^{(n)}\}$$

selected partly for their capacity to expose dependence upon different access conditions.

The epistemic value of an invariant therefore increases through successful survival of relevant attempts at destabilization.

This suggests a methodological principle:

Cross-relational robustness should be sought through transformations capable of breaking the candidate invariant, rather than through comparison designed only to reproduce it.

Failure under such a transformation is informative because it identifies a boundary of the structure's validity.

7.14 Failure as Epistemic Information

Failure of invariance can strengthen knowledge even when it weakens a particular universal claim.

Suppose a structure survives several transformations and then fails when one previously unvaried condition changes.

The failure identifies a dependency:

$$I = I(\mathcal{C}^k)$$

for some condition or family of conditions $\mathcal{C}^k$.

The result narrows the scope of the invariant while increasing understanding of its generative conditions.

A formerly universal claim may therefore become a local or conditional one.

This is an epistemic gain.

GR consequently treats disconfirmation of invariance as part of the generative development of knowledge.

7.15 Local Objectivity

The preceding analysis supports a form of local and provisional objectivity.

An epistemic claim can be robust relative to a specified range of relational variation:

$$\mathcal{V}_t = \{\Delta\mathcal{C}^{(1)}, \dots, \Delta\mathcal{C}^{(n)}\}.$$

The resulting objectivity is indexed to the transformations and conditions tested.

Such indexing does not trivialize objectivity. It states its evidential basis explicitly.

A claim that survives changes in observer, instrument, language, scale, and historical setting possesses a different epistemic status from a claim observed only within one narrow configuration.

Yet even the more robust claim remains open to future relational variation outside the tested domain.

Objectivity can be understood as stability earned through relational variation rather than as a standpoint detached from every relation.

This is one of the principal epistemological commitments of the paper.

7.16 Degrees of Epistemic Commitment

Epistemic commitment should track the robustness profile of the structure under consideration.

A locally observed pattern warrants a limited commitment.

A structure reproduced under multiple independent methods warrants a stronger commitment.

A structure preserved across heterogeneous instruments, conceptual systems, historical periods, scales, or cognitive architectures warrants progressively broader confidence with respect to the conditions that have been varied.

This produces a qualitative progression:

$$K^{\text{local}} \prec K^{\text{replicated}} \prec K^{\text{cross-rel}} \prec K^{\text{hetero-robust}}.$$

The ordering represents increasing breadth of tested relational conditions. It does not imply that every claim can be placed unambiguously on one linear scale.

Different robustness dimensions may conflict. One structure may possess strong historical persistence but weak cross-scale stability. Another may be highly reproducible within one formal system but poorly translatable across conceptual systems.

Epistemic commitment should therefore remain multidimensional.

7.17 Robustness and Ontological Inference

The central philosophical problem now becomes sharper.

Suppose I possesses a strong robustness profile. It survives several independent methods, historical changes, representational transformations, scales, and heterogeneous cognitive conditions.

The evidential case that I exceeds the peculiarities of any one tested manifestation system becomes correspondingly strong.

A further question remains:

$$I^{\text{robust}} \xrightarrow{?} I^{\text{ont}}.$$

The present framework does not supply a universal rule for this transition.

Ontological interpretations may differ while accepting the same robustness evidence. A structural realist may treat persistent structure as grounds for realist commitment. A perspectival realist may interpret it as robust structure available across perspectives. A more cautious position may treat it as the strongest currently available epistemic constraint while suspending further metaphysical commitment.

GR permits these interpretations to remain distinct.

The contribution of cross-relational analysis is to make explicit the evidential structure upon which such metaphysical arguments would have to operate.

7.18 Robustness and the Three Domains of Reality

The distinction among

$$\mathfrak{R}^{\text{epi}}, \quad \mathfrak{R}^{\text{rel}}, \quad \mathfrak{R}^{\text{ont}}$$

can now be revisited.

At the epistemic level, robustness concerns structures preserved across modes of access.

At the level of relational reality, robustness may concern forms or generative relations that remain effective across transformations of relational configuration.

At the ontological level, robustness becomes evidence to be interpreted rather than direct access to the domain itself.

The three levels therefore support different claims.

A robust epistemic invariant may provide reliable orientation within inquiry.

A robust relational structure may participate persistently in causal or generative dynamics.

An ontological symmetry claim attributes the preserved structure to reality independently of the manifestation systems through which it has been identified.

The transition among these claims requires separate justification.

7.19 Generative Feedback of Robust Knowledge

Robust epistemic structures also become generative conditions of later inquiry.

Once an invariant acquires high epistemic confidence, it can shape theory, instrumentation, classification, education, policy, and future comparison.

The process can be represented as

$$\mathcal{I}_t \rightsquigarrow K_t \rightsquigarrow \mathcal{C}_{t+1} \rightsquigarrow \mathcal{I}_{t+1}. \quad (46)$$

This recursion introduces a potential difficulty.

Later systems may agree with an earlier invariant partly because their instruments, theories, or categories were designed around it.

Epistemic success can therefore create dependence among later confirmations.

A mature robustness analysis must distinguish genuinely new relational tests from repetitions produced within an epistemic environment already structured by the invariant.

This is another reason why historical and genealogical analysis belongs inside epistemology.

7.20 Critical Dependence and Epistemic Entrenchment

As an invariant becomes embedded in epistemic infrastructure, it can acquire a form of self-reinforcement.

Measurement systems may encode it.

Educational practices may teach it as foundational.

Data standards may presuppose it.

Research questions may be formulated within its conceptual grammar.

The resulting epistemic field can increasingly reproduce the same structure:

$$I_t \rightsquigarrow \mathcal{C}_{t+1} \rightsquigarrow I_{t+1}.$$

Such persistence can reflect genuine robustness, institutional entrenchment, or both.

The distinction cannot be made from persistence alone.

GR therefore introduces a genealogical question into robustness analysis:

Did the invariant survive an independently generated variation, or did the earlier invariant help construct the conditions under which it was later reproduced?

This question becomes especially important in social, economic, legal, and religious domains where classifications can modify the systems classified.

7.21 Revisability of Epistemic Robustness

Robustness remains historically revisable.

Let

$$\mathbf{E}_t(I)$$

denote the robustness profile of I at time t .

New evidence or new relational systems can produce

$$\mathbf{E}_t(I) \longrightarrow \mathbf{E}_{t+1}(I). \quad (47)$$

The later profile may strengthen, weaken, or reorganize the epistemic status of the invariant.

A new instrument may extend its domain.

A new historical reconstruction may restrict it.

A previously inaccessible scale may reveal breakdown.

A new cognitive or cultural system may preserve the structure through an unexpected representation.

Robustness therefore records the history of tests survived so far.

The phrase *so far* is epistemologically essential.

7.22 Architecture of Epistemic Robustness

The epistemic architecture developed in this section can be summarized through five questions.

First, what candidate structure has remained invariant?

Second, which relevant conditions of manifestation were varied?

Third, which conditions remained shared?

Fourth, how independent were the pathways through which the manifestations were generated?

Fifth, what alternative mechanisms could produce the same observed persistence?

These questions transform invariance from a formal observation into an epistemological assessment.

The resulting principle can be stated succinctly:

Epistemic robustness grows through the survival of structure across relevant, independent, and explicitly reconstructed relational variation, while the scope of the resulting commitment remains limited by shared conditions, transformation loss, and untested modes of access.

Cross-relational invariance therefore provides neither a mechanical truth criterion nor a view from nowhere. It provides a procedure for increasing epistemic confidence through disciplined variation of the relations under which manifestations become available.

The next section tests this procedure through preliminary cases in which reality, subjecthood, generativity, and relational forms are manifested through substantially different conceptual and historical systems.

8 Preliminary Case Studies

This section applies cross-relational invariance to several preliminary cases. The purpose is methodological. The cases test whether the framework can distinguish structural persistence from superficial similarity, identify the conditions under which comparison is possible, and register cases in which an expected invariant fails.

The examples include Daoist and contemporary formal representations of generativity, Buddhist analyses of the self, political-economic forms such as money and credit, and a limiting thought experiment involving hypothetical non-human cognition. These domains differ substantially in historical origin, epistemic purpose, conceptual vocabulary, and ontological commitment. Their comparison therefore does not presume a common metaphysics.

Each case follows the same general procedure:

manifestations $\rightarrow$ comparison domain $\rightarrow$ candidate transformation $\rightarrow$ candidate invariant $\rightarrow$ boundary of the com

The cases are preliminary because a complete application would require domain-specific historical, linguistic, empirical, and formal work. Their present role is to demonstrate how cross-relational invariance can organize such inquiry without determining its results in advance.

8.1 Daoist Manifestations of Generativity

Daoist materials provide a particularly useful case because they direct attention toward generation, transformation, and spontaneous becoming without requiring that generation be attributed to a privileged generating subject. Selected formulations associated with Dao, *ziran*, and *wuwei* therefore provide a historically situated relational manifestation of generativity [?].

The present analysis separates possible generativity from its historical manifestation:

$$\mathcal{G}^* ; \mathcal{G}_{D,t}^{\text{rel}},$$

where the subscript D identifies a selected Daoist relational configuration.

The distinction is important. GR does not identify Daoist descriptions of generation with the generative structure of reality itself. It treats them as historically situated manifestations through which generativity became conceptually, symbolically, and practically available.

A further symbolic articulation can be represented as

$$\mathcal{G}_{D,t}^{\text{rel}} \rightsquigarrow \Sigma_{D,t},$$

where $\Sigma_{D,t}$ denotes the relevant grammar through which processes of change are interpreted.

Different historical Chinese traditions developed heterogeneous symbolic grammars involving polarity, temporal transformation, correspondence, cyclicity, and combinatorial patterns. Trigrams, hexagrams, correlative classifications, and related structures belong to different textual and historical contexts and should not be collapsed into a single “Daoist model.” Their relevance here lies in the more general fact that perceived generativity can become symbolically organized.

A contemporary mathematical or dynamical description of change may instead produce

$$\mathcal{G}_{M,s}^{\text{rel}} \rightsquigarrow \Sigma_{M,s},$$

where $\Sigma_{M,s}$ may include state spaces, differential equations, transition systems, probability distributions, or dynamical models.

Clearly,

$$\Sigma_{D,t} \neq \Sigma_{M,s}.$$

Cross-relational inquiry should therefore avoid any direct claim that a hexagram is equivalent to a dynamical equation or that classical Chinese cosmology already contained contemporary dynamical systems theory.

The appropriate question concerns candidate generative structure.

For example, one may ask whether both systems encode some form of

state dependence, transition, recurrence, polarity, context-sensitive transformation,

without presuming that the local meanings of those categories are identical.

A candidate comparison space $\mathcal{Z}_{\text{gen}}$ could therefore contain abstract generative relations rather than the traditions’ original symbols.

The mapping would take the form

$$I_D : \Sigma_{D,t} \rightarrow \mathcal{Z}_{\text{gen}}, \quad I_M : \Sigma_{M,s} \rightarrow \mathcal{Z}_{\text{gen}}.$$

A candidate invariant would be established only where

$$I_D(\Sigma_{D,t}) \sim I_M(\Sigma_{M,s})$$

under historically and conceptually justified reconstruction.

The word *candidate* is essential.

The purpose of cross-relational comparison is to test whether a generative relation survives translation between heterogeneous grammars, not to produce similarity by translating both systems into abstractions selected in advance.

The case therefore places a strong burden upon the construction of the common comparison space.

8.2 Historically Generated Manifestations of Generativity

The Daoist case also reveals a deeper recursive problem.

A relational system does not merely observe generativity. It develops a historically situated manifestation of generativity and subsequently acts through that manifestation.

The process can be represented as

$$\mathcal{G}^* ; \mathcal{G}_{a,t}^{\text{rel}} \rightsquigarrow \Sigma_{a,t} \rightsquigarrow A_{a,t+1} \rightsquigarrow \mathfrak{R}_{a,t+1}. \quad (48)$$

A symbolic grammar of change may influence decisions, practices, timing, rituals, governance, or interpretations of later events. The representation of generativity thereby enters the generative process it describes.

This gives generativity a reflexive epistemic structure:

The relational manifestation of generation can itself become one of the conditions through which later generation occurs.

The case therefore distinguishes three levels:

$$\mathcal{G}^* ; \mathcal{G}_{a,t}^{\text{rel}} ; \Sigma_{a,t}.$$

The first marks possible generativity independently of the particular system. The second denotes how generativity becomes relationally manifested within that system. The third denotes its symbolic or conceptual articulation.

Cross-relational invariance may be sought between the second or third levels. The existence of such invariance does not establish that the identified structure belongs directly to $\mathcal{G}^*$.

8.3 Daoist Sacred Generativity

The same distinction also clarifies the relation between this paper and the preceding GRR analysis.

Selected Daoist configurations can assign sacred, ultimate, or orienting significance to the generativity through which beings and conditions transform. In the terminology developed in the preceding paper, this can be represented as

$$\mathcal{G}_{D,t}^{\text{rel}} \xrightarrow{S_t} \mathcal{G}_{D,t}^{\text{div}}.$$

This formulation does not attribute divinity to $\mathcal{G}^*$. It describes the historical sacralization of a relational manifestation of generativity.

The epistemological question of the present paper is different.

One can ask whether some structure of generativity remains invariant across religious, philosophical, scientific, or other relational manifestations without requiring those manifestations to share their sacred interpretation.

Thus,

$$\text{Div} \left(\mathcal{G}_{D,t}^{\text{rel}} \right)$$

may be local to the Daoist relational configuration while

$$I_{\text{gen}}$$

could, in principle, survive beyond that configuration.

This distinction separates cross-relational structural persistence from the religious significance assigned to the preserved structure.

8.4 Buddhist Analysis of the Self

Buddhist analyses of selfhood provide a different type of case.

Selected Buddhist traditions analyze the person through dependent formation and reject intrinsic self-subsistence. Madhyamaka in particular develops emptiness in relation to dependent arising and denies inherent nature to phenomena without reducing conventional causal life to nullity [6, ?].

For the present paper, the epistemological interest concerns the plurality of manifestations through which something called the “self” becomes available.

Consider several relational systems:

$$\mathcal{X}_{\text{first}}, \quad \mathcal{X}_{\text{social}}, \quad \mathcal{X}_{\text{legal}}, \quad \mathcal{X}_{\text{economic}}, \quad \mathcal{X}_{\text{biological}}.$$

Each can stabilize a different manifestation of a person.

The first-person system may organize experience through memory, agency, continuity, desire, and bodily awareness.

A legal system may organize the person through identity, rights, responsibilities, liability, and continuity across institutional time.

Political economy may manifest the person through positions such as worker, owner, consumer, creditor, or debtor.

A biological description may track bodily continuity and physiological organization.

These manifestations differ:

$$x_{\text{first}} \neq x_{\text{legal}} \neq x_{\text{economic}} \neq x_{\text{biological}}.$$

The cross-relational question is therefore whether any structures survive translation among them.

8.5 Invariant Self and Failure of Invariance

A naïve comparison might search for a single entity S that remains identical across every manifestation.

The Buddhist case warns against presuming that such an invariant must exist.

Some structures may persist:

causal continuity, memory relations, bodily dependency, social attribution, responsiveness.

Yet the substantial self imagined as an independently existing and self-identical entity may fail to survive cross-relational reconstruction.

In that case, failure of invariance becomes epistemically significant.

A category treated as an invariant entity may dissolve under relational variation while a family of causal, temporal, bodily, and social relations continues to persist.

This suggests a shift from invariant entity to invariant relational structure.

Instead of seeking

$$I(S) = S,$$

the analysis may identify a family

$$\mathcal{I}_{\text{self}} = \{I^{\text{causal}}, I^{\text{temporal}}, I^{\text{bodily}}, I^{\text{social}}, \dots\}.$$

The Buddhist case therefore provides a useful stress test for structural realism within GR. What survives cross-relational transformation may be relations and continuities rather than the entity through which those relations are ordinarily compressed.

8.6 Efficacy without Intrinsic Substantiality

The Buddhist case also connects cross-relational epistemology with relational reality.

A person can lack intrinsic self-subsistence in a Buddhist analysis while remaining causally consequential within conventional relational dynamics:

$$H_t \rightsquigarrow \mathfrak{R}_{t+1}.$$

The same distinction can be applied to religiously significant forms.

A Buddha, bodhisattva, vow, karmic category, or sacred symbol can participate in later desire, practice, normativity, compassion, institutional life, or material conduct without the present analysis settling its independent metaphysical status.

The cross-domain structural principle is:

Absence of intrinsic substantiality does not entail absence of persistent relational or causal efficacy.

This principle itself becomes a candidate cross-relational invariant.

The question is whether an analogous distinction appears in domains whose local vocabularies differ radically from Buddhist metaphysics.

Political economy provides one such domain.

8.7 Money as a Relational Form

Money offers a comparatively familiar case of relationally constituted efficacy.

The material carrier of money does not exhaust its monetary function. A banknote, account balance, deposit, or another monetary form operates through historically constituted relations of exchange, recognition, law, institution, accounting, and practice.

A monetary form can therefore be represented through the recursive structure

$$\mathfrak{R}_t^{PE} \rightsquigarrow M_t \rightsquigarrow \mathfrak{R}_{t+1}^{PE}.$$

Marx's analysis of the commodity and money forms provides a powerful account of social relations acquiring objective forms that subsequently participate in economic reproduction [4].

The cross-relational problem concerns variation among monetary manifestations.

Consider

$$M^{(1)}, M^{(2)}, \dots, M^{(n)}$$

with different material carriers, institutional arrangements, legal architectures, and technological infrastructures.

The manifestations can differ substantially while preserving selected functions or relations.

Possible candidate invariants may include

transfer, settlement, valuation, claim recognition, coordination of exchange.

No single function should be presumed universal to every historically recognized monetary configuration.

The task is therefore to construct an explicit comparison domain and determine which structures actually persist.

8.8 Credit and Temporal Generativity

Credit provides an even more revealing case because it organizes present relations through claims upon future possibilities.

A credit form can be represented as

$$C_t = \mathcal{E}_C (\text{claim, obligation, trust, institution, expectation})_t .$$

It can subsequently enter productive dynamics:

$$C_t \rightsquigarrow I_{t+1}^{\text{inv}} \rightsquigarrow P_{t+2} .$$

Credit can therefore participate in producing a future that exists only as a relationally organized possibility at the time the credit relation is formed. Marx's analysis of credit and interest-bearing capital places such claims within the reproduction of capital [5].

This produces a striking cross-domain correspondence with the Buddhist distinction developed above.

Credit is not materially identical to the future production it helps enable. Its efficacy does not depend upon such identity.

Likewise, a relationally stabilized subject or symbolic form need not possess intrinsic substantiality in order to participate in subsequent generation.

The candidate common structure is therefore

$$\mathfrak{R}_t \rightsquigarrow X_t \rightsquigarrow \mathfrak{R}_{t+1} .$$

This structure appears across substantially different domains.

The comparison does not establish that a person, a religious form, money, and credit share an ontology.

It identifies a possible dynamical invariant:

A relationally generated form can become a condition of subsequent generation.

8.9 Cross-Domain Invariance and Ontological Difference

The political-economic comparison illustrates why cross-relational invariance should remain indexed to the structure being preserved.

Suppose the following systems all instantiate

$$\mathfrak{R}_t \rightsquigarrow X_t \rightsquigarrow \mathfrak{R}_{t+1} .$$

Here X_t may denote a socially stabilized person, monetary form, credit relation, religious subject, or another relationally real configuration.

The common dynamical structure does not imply

$$X_t^{(1)} \equiv X_t^{(2)} .$$

Their materiality, phenomenology, ontology, institutional form, and normative meaning may remain radically different.

The invariant is therefore located at the level of relational generation:

$$I_{\text{gen}} (\mathfrak{R}_t, X_t, \mathfrak{R}_{t+1}) .$$

This is a central methodological advantage of the framework.

Cross-relational invariance permits comparison strong enough to identify structure while preserving differences outside the comparison domain.

8.10 Reification as a Failure of Level Distinction

The political-economic case also provides a useful warning.

A relation-generated form may acquire such stability that relationally generated efficacy appears as an intrinsic property of the form.

Marx's analysis of commodity fetishism provides a classical instance of a related process in which social relations assume objective form [4].

Within GR, the generalized movement can be represented as

$$\text{Power}(\mathfrak{R}) \longmapsto \text{Property}(X).$$

The epistemological problem is a failure to preserve the distinction between relational efficacy and intrinsic substantiality.

This is directly relevant to cross-relational invariance.

If an apparently intrinsic property disappears when the relational configuration changes, the failure of invariance exposes the dependence of that property upon the original system.

Thus, transformation becomes a method for testing reification.

What appears intrinsic within one stable relational configuration may reveal its relational dependence when the configuration is systematically varied.

8.11 Hypothetical Non-Human Cognition

The preceding cases remain within human historical and cognitive worlds. A limiting thought experiment can extend the framework further.

Suppose a non-human intelligent system A possesses perceptual, embodied, temporal, and symbolic capacities substantially different from those of humans.

Let

$$\mathcal{C}_H \neq \mathcal{C}_A.$$

The two systems may encounter a possible generative domain $\mathcal{G}^*$ through different relational manifestations:

$$\mathcal{G}_H^{\text{rel}} \neq \mathcal{G}_A^{\text{rel}}.$$

They may subsequently construct different symbolic grammars:

$$\Sigma_H \neq \Sigma_A.$$

The difference could be profound. A non-human system might possess different primitive categories of object, event, duration, identity, quantity, or causality. Its knowledge need not be a translation of human scientific vocabulary.

The epistemological question is whether any meaningful transformation

$$G_{HA}$$

can be constructed between limited regions of these manifestation spaces.

8.12 Cross-Cognitive Invariance of Generativity

Suppose a partial transformation becomes possible.

The comparison could ask whether certain generative relations survive:

dependency, transition, recurrence, constraint, coupling, branching.

If

$$I_H(\Sigma_H) = I_A(\Sigma_A)$$

for a structure I under a justified cross-cognitive transformation, the result would be epistemically significant because many specifically human conditions of access had been varied.

Yet the ontological inference would still remain open.

The shared invariant could arise from structure associated with $\mathcal{G}^*$, from constraints common to any system capable of successful interaction with the domain, or from the architecture of the translation through which comparison became possible.

The case therefore sharpens the central thesis of the paper:

Increasing heterogeneity can strengthen the epistemic force of an invariant while never eliminating the need to ask why that invariant survived.

8.13 The Possibility of Alien Generative Grammars

The thought experiment also clarifies the distinction between generativity and its manifestations.

Human systems have developed multiple grammars of becoming: religious cosmologies, symbolic systems of transformation, causal narratives, calculus, dynamical systems, probability theory, statistical mechanics, and other formal structures.

None can be identified automatically with generativity itself:

$$\Sigma_H ; \mathcal{G}^*.$$

A non-human civilization could develop an entirely different grammar Σ_A while successfully navigating the same possible reality.

The existence of radically different successful grammars would weaken any claim that a specifically human representational structure directly mirrors reality.

At the same time, structures preserved across such grammars would become especially interesting candidates for epistemic robustness.

This thought experiment therefore creates a useful double movement:

Manifestational diversity weakens naïve identification between representation and reality, while cross-manifestational invariance can strengthen confidence in structures that survive that diversity.

8.14 Comparison of the Preliminary Cases

The cases can now be compared according to the relational variation they introduce.

The table illustrates that no invariant is meaningful independently of the variation through which it is tested.

The same candidate structure can acquire different epistemic significance under different transformation histories.

Table 1: Preliminary cases for cross-relational invariance

Case	Relational variation	Candidate invariant	Principal risk
Daoist and formal grammars of change	Historical, symbolic, conceptual, and formal variation	Generative relations such as dependency, transition, recurrence, or context-sensitive change	Retrospective projection of modern categories onto historical materials
Buddhist analysis of self	First-person, social, legal, economic, biological, and philosophical manifestations	Causal, temporal, bodily, or relational continuity	Presuming a substantial invariant subject before comparison
Money and credit	Material carrier, institutional structure, legal form, technology, and historical regime	Selected functions and recursive generative mediation	Treating functional correspondence as ontological equivalence
Hypothetical non-human cognition	Embodiment, perception, temporal scale, symbolic grammar, and cognitive architecture	Cross-cognitive relational or generative structure	Building human assumptions into the translation space

8.15 Cases of Invariance and Cases of Breakdown

The preliminary applications also demonstrate that cross-relational inquiry should expect several possible outcomes.

A candidate structure may remain invariant.

It may remain approximately invariant.

It may survive only within a restricted domain or scale.

It may split into several structures after translation.

It may disappear completely.

Each outcome has epistemic value.

Consider the substantial self. Cross-relational comparison may fail to preserve a single entity while preserving several relational continuities.

Consider money. Some functions may survive across monetary regimes while others depend upon specific institutions.

Consider generative grammars. A broad relation such as dependency may survive while a particular symbolic classification remains historically local.

The purpose of the framework is therefore to produce a more differentiated epistemic map rather than to maximize the number of invariants discovered.

8.16 Case-Generated Revision of the Framework

The cases also modify the general theory.

The Daoist case requires a distinction between possible generativity, relational manifestation of generativity, and symbolic grammar:

$$\mathcal{G}^* ; \mathcal{G}_{a,t}^{\text{rel}} ; \Sigma_{a,t}.$$

The Buddhist case demonstrates that failure of entity invariance can coexist with persistence of relational structure.

The political-economic case demonstrates that relationally constituted forms can possess substantial causal efficacy and that this efficacy can itself become reified.

The non-human cognition case demonstrates that anthropocentric conditions must be included among the variables against which claims of universality are tested.

The general framework therefore changes through its applications:

$$\mathcal{F}_{\text{CRI}}^{(0)} \longrightarrow \{\mathcal{P}_D, \mathcal{P}_B, \mathcal{P}_{PE}, \mathcal{P}_A\} \rightsquigarrow \mathcal{F}_{\text{CRI}}^{(1)}. \quad (49)$$

The cases function as sources of theoretical revision rather than illustrations appended to a completed formal system.

8.17 Epistemic Lessons from the Cases

Several lessons follow.

First, invariance should be sought at the level appropriate to the comparison. Entity identity, relational structure, function, generative rule, and historical continuity represent different possible objects of invariance.

Second, the common comparison space must remain contestable. A poorly chosen space can manufacture invariance through abstraction.

Third, failure of invariance can disclose the local conditions through which a category became intelligible.

Fourth, relational efficacy and intrinsic substantiality should remain analytically separate.

Fifth, stronger heterogeneity can increase the epistemic significance of persistence while simultaneously making transformation more difficult.

Sixth, successful comparison does not erase local meaning.

The cases therefore support a general methodological principle:

Cross-relational inquiry should preserve enough difference for the survival of a structure to be informative.

If comparison removes every significant difference before invariance is tested, the resulting agreement has little epistemological force.

8.18 Transition from Cases to Reality

The preliminary cases bring the paper back to its central philosophical problem.

Daoist and scientific grammars may preserve selected structures of generativity.

Buddhist and non-Buddhist descriptions of persons may preserve relational continuities while differing over substantial selfhood.

Different monetary and credit systems may preserve generative functions through heterogeneous institutional forms.

Hypothetical non-human cognition may preserve structures that survive variation in specifically human modes of access.

In each case, cross-relational invariance can increase confidence that the preserved structure exceeds some of the conditions specific to one manifestation system.

The remaining question is how far this epistemic achievement permits inquiry to move toward claims concerning reality itself.

When a structure survives increasingly heterogeneous modes of relational access, what exactly becomes justified: confidence in the structure, realism about the structure, symmetry of relational reality, or symmetry of ontological reality?

The next section addresses this transition by examining the relation among cross-relational invariance, structural realism, epistemic commitment, and ontological interpretation.

9 Reality, Structure, and Epistemic Commitment

This section examines the epistemic and metaphysical interpretation of cross-relational invariance. The preceding sections established that a structure may persist across heterogeneous manifestations and that such persistence can acquire epistemic robustness when relevant conditions of access are varied. A further question now arises: what kind of commitment to reality, if any, is warranted by that robustness?

The problem concerns the relation among three domains introduced earlier:

$$\mathfrak{R}^{\text{epi}} ; \mathfrak{R}^{\text{rel}} ; \mathfrak{R}^{\text{ont}}.$$

Cross-relational inquiry begins within $\mathfrak{R}^{\text{epi}}$, where manifestations, transformations, and comparison procedures are available to investigation. Some of the forms encountered there become relationally real through persistent participation in subsequent generative dynamics. The strongest philosophical question concerns whether structures identified through these domains warrant claims about $\mathfrak{R}^{\text{ont}}$.

The paper develops no automatic transition among these levels. It instead examines a graduated relation between epistemic robustness and ontological commitment.

9.1 Epistemic Invariance and Reality

Suppose a candidate structure I survives transformations among several relational systems:

$$I_{a_1}(x_{a_1}) \sim I_{a_2}(x_{a_2}) \sim \cdots \sim I_{a_n}(x_{a_n}).$$

Suppose further that these systems differ in conditions relevant to the production of I , that their epistemic pathways possess substantial independence, and that known shared distortions have been examined.

The resulting structure has survived several opportunities for manifestation-specific failure.

This matters epistemically.

The comparison provides grounds for treating I as less dependent upon the particular conditions varied across the systems. The conclusion remains indexed to those variations. If embodiment, language, instrumentation, scale, historical period, or conceptual grammar has been varied, the evidence bears upon dependence on those conditions.

The resulting commitment can be stated without a metaphysical leap:

A cross-relationally robust structure is increasingly difficult to explain as an artifact of any one of the relational conditions under which it has been successfully reconstructed.

This is already a substantive epistemic achievement.

9.2 From Manifestation-Dependence to Manifestation-Transcendence

The term *manifestation-transcendence* can be used cautiously to describe a structure whose validity exceeds a specified manifestation system.

If I survives transformation from system a to system b , then the evidence supports the claim that I is not exhausted by the peculiarities of system a .

If it survives across a larger and more heterogeneous family $\mathcal{A}_I$, the domain of demonstrated independence expands.

This produces a relational progression:

$$\mathcal{A}_I^{(1)} \subseteq \mathcal{A}_I^{(2)} \subseteq \dots$$

as new systems are successfully incorporated into the invariant domain.

Manifestation-transcendence remains weaker than ontological transcendence. A structure can exceed every manifestation system tested so far while still depending upon conditions shared by those systems or upon constraints built into the comparison itself.

The distinction is therefore between

independence from tested conditions

and

independence from every possible condition of access.

Only the first can be established through finite cross-relational inquiry.

9.3 Epistemic Robustness and Structural Realism

Structural realism offers one natural interpretation of persistent cross-relational structure. If entities and theoretical vocabularies change while certain relations survive, the preserved structure may appear to be a better candidate for realist commitment than any one representation [10].

Cross-relational invariance strengthens this intuition by extending the range of possible transformations. The relevant variation can include differences among theories, instruments, languages, historical configurations, cultural grammars, scales, and possible cognitive architectures.

A robust invariant can therefore provide evidence for a form of structural realism:

$$I^{\text{robust}} \rightsquigarrow \text{realist commitment to } I.$$

The arrow records an argumentative possibility rather than a logical implication.

GR retains several reasons for caution.

First, the invariant is identified through a comparison space that is itself constructed within inquiry.

Second, all currently available manifestations may share hidden conditions.

Third, a preserved structure can be an invariant of the access architecture rather than of the ontological domain.

Fourth, later relational systems may reveal previously invisible variation.

Structural realism therefore appears within GR as one possible metaphysical interpretation of cross-relational robustness rather than the mandatory conclusion of the framework.

9.4 Epistemic Reality and Structural Constraint

A weaker and more immediately defensible conclusion concerns epistemic reality.

A highly robust invariant constrains viable descriptions within the tested domain.

New representations that fail to preserve the structure require explanation. A theory, model, or interpretation that violates a well-supported invariant carries an additional evidential burden.

The invariant therefore becomes part of the epistemic environment:

$$\mathcal{I}_t \rightsquigarrow \mathcal{C}_{t+1}.$$

In this sense, epistemically robust structures acquire reality within inquiry. They regulate prediction, interpretation, experimentation, comparison, and future theory construction.

Such epistemic reality does not depend upon a claim that the invariant is an ultimate constituent of the world.

It depends upon the structure's demonstrated capacity to survive relevant epistemic variation and constrain subsequent inquiry.

9.5 Relational Reality and Invariant Structure

The relation between cross-relational invariance and relational reality requires separate treatment.

Relational reality concerns generative mediation:

$$\mathfrak{R}_t \rightsquigarrow X_t^{\text{rel}} \rightsquigarrow \mathfrak{R}_{t+1}.$$

A relationally real form can be historically local. Its causal efficacy does not require that the same form appear across heterogeneous systems.

Cross-relational invariance concerns preservation across transformations.

Consequently,

$$\text{RR}(X)$$

and

$$\text{Inv}_{\text{cross}}(X)$$

measure different aspects of a phenomenon.

A monetary form may be strongly relationally real within a particular institutional regime while lacking invariant form across other economic systems.

A religious subject may organize generations of practice and social life while remaining specific to one historical tradition.

Conversely, a mathematical relation may be highly invariant across representations while lacking the same kind of socially generative relational reality.

The two concepts intersect where a relationally real structure also persists across relational transformation.

Such cases are especially interesting because the structure exhibits both generative efficacy and cross-relational robustness.

9.6 Reality as Constraint on Manifestation

One possible interpretation of cross-relational invariance treats reality as a source of constraint.

If heterogeneous relational systems repeatedly generate manifestations that preserve some structure, one explanation is that the systems interact with a domain that constrains the range of viable manifestations.

This interpretation can be represented schematically through

$$X^* \rightsquigarrow \{x_a, x_b, x_c, \dots\},$$

where the arrow marks constraint or participation without specifying its metaphysical mechanism.

The idea is deliberately weaker than representation as mirroring.

Reality need not determine one unique manifestation. Different systems may produce substantially different forms while remaining constrained in ways that preserve selected relations.

This suggests a possible realist principle:

Reality may constrain heterogeneous manifestations without appearing identically within any of them.

Cross-relational invariance can then be interpreted as one possible trace of such constraint.

The interpretation remains defeasible because common constraints can also arise from shared features of the manifestation systems themselves.

9.7 Underdetermination of Ontological Interpretation

The same robust invariant can support several metaphysical interpretations.

A realist may regard it as evidence for structure in a mind-independent reality.

A structural realist may privilege the invariant relation while remaining agnostic about the entities carrying it.

A perspectival realist may interpret the structure as stable across multiple perspectives without claiming access to a perspective-independent description.

An idealist interpretation may locate the invariant within conditions of experience or cognition.

A process-oriented metaphysics may interpret the invariant as a stable relation within becoming.

GR need not resolve these metaphysical differences before evaluating the epistemic evidence.

This produces a familiar structure:

$$\mu_i \neq \mu_j, \quad \mathcal{A}(\mu_i) \cap \mathcal{A}(\mu_j) \neq \emptyset,$$

where distinct metaphysical positions can share part of the cross-relational analysis.

The framework therefore provides a common evidential domain within which metaphysical disagreement can become more precisely located.

9.8 The Symmetry Question Revisited

The subtitle can now be reformulated with greater precision.

The question *Does Reality Have Symmetry?* contains several possible claims.

At one level, epistemic representations possess transformations under which selected structures remain invariant.

At another, relationally real systems may exhibit persistent generative structures under transformation.

At the strongest level, one claims that reality independently of any particular manifestation possesses corresponding symmetry.

The first two claims can be investigated directly within specified domains.

The third is an ontological interpretation of the first two.

A careful answer therefore takes the form:

Reality as epistemically and relationally accessible can exhibit robust invariance under specified transformations. Whether such invariance expresses symmetry of reality independently of every possible mode of access remains an open metaphysical inference whose credibility can increase without becoming identical to proof.

This is the central answer developed by the paper.

9.9 Symmetry as a Property of Reality or Access

A particularly important ambiguity concerns the location of symmetry.

Suppose a structure is preserved under transformations among manifestations.

At least three interpretations remain possible:

$$I \in \text{Structure} \left(\mathfrak{R}^{\text{ont}} \right),$$

$$I \in \text{Structure} \left(\mathcal{M} \right),$$

or

$$I \in \text{Structure} \left(\mathfrak{R}^{\text{ont}}, \mathcal{M} \right).$$

The first locates the invariant primarily in ontological reality.

The second locates it primarily in the architecture of manifestation.

The third treats it as emerging through the relation between reality and conditions of access.

The third possibility is especially important for GR because the framework does not require every epistemically stable structure to be assigned wholly to one side of a subject–object division.

An invariant may be relationally constituted through recurring interaction between a domain and systems capable of engaging with it.

This possibility gives the title question another interpretation:

> Does symmetry belong to reality, to our modes of access, or to the > recurrent relation between them?

Cross-relational inquiry can constrain the possible answers even where it cannot select one final metaphysics.

9.10 Observer-Independent and Relation-Independent Reality

The distinction between observer-independence and relation-independence is also important.

A structure can be independent of a particular observer:

$$I_a = I_b,$$

while still depending upon a wider relational architecture shared by both.

Observer-independence therefore does not imply relation-independence.

This distinction matters especially when claims of objectivity are inferred from intersubjective agreement.

Many observers may converge because they occupy sufficiently similar relations to the domain.

Cross-relational invariance seeks stronger variation by changing relevant relations themselves.

Even then, no finite comparison can demonstrate independence from every possible relational condition.

The appropriate epistemic progression is therefore from observer-independence toward increasingly broad relation-independence, while the limiting idea of complete relation-independence remains metaphysically open.

9.11 Cross-Relational Universality

The framework therefore needs a careful concept of universality.

A claim can be universal within a specified transformation family without being universal across every possible manifestation system.

Let

$$\mathcal{T} = \{G_1, \dots, G_n\}$$

denote the tested transformations.

A structure can be described as cross-relationally universal over $\mathcal{T}$ when it survives the relevant members of that family.

This is a scoped universality.

The scope can expand as new transformations are tested.

A statement such as “this structure is universal” should therefore be interpreted together with the relational domain over which universality has been established.

This preserves strong generalization while avoiding an unmarked transition from historically available evidence to unrestricted metaphysical universality.

9.12 Negative Ontological Evidence

Failure of invariance can also bear upon ontological interpretation.

Suppose a feature repeatedly disappears when specific access conditions are varied.

The evidence then supports dependence upon those conditions.

For example, an apparently intrinsic category may dissolve across cultural, scale, or cognitive transformations while more abstract relations persist.

Such failure does not prove that the category has no ontological correlate. It weakens the warrant for treating the manifestation-specific form as a universal structure of reality.

This produces an asymmetry in epistemic burden.

Robust persistence can gradually strengthen a realist interpretation.

Systematic failure under relevant variation can progressively localize a claim to the conditions under which it appears.

Both outcomes contribute to knowledge of the boundary between manifestation and possible reality.

9.13 The Reality of Difference

A theory centered on invariance must also preserve the epistemic importance of difference.

If only invariant structure is treated as real, manifestation-specific differences risk becoming epistemically secondary by definition.

GR resists this reduction.

Differences can themselves be relationally real. They can affect action, experience, institutions, material processes, or historical development.

A culturally specific sacred form may lack broad cross-relational invariance while exerting substantial generative effects.

A local biological adaptation may be highly contingent while remaining materially real.

A historically specific institution may disappear under cross-cultural comparison while profoundly organizing a society.

Cross-relational invariance therefore identifies one dimension of epistemic robustness. It does not define the complete domain of reality.

What varies can be as relationally real as what remains invariant; invariance answers a question about persistence across transformation, not a question about which phenomena deserve to count as real.

This distinction is especially important for historical and social inquiry.

9.14 Invariance and Becoming

The relation between invariance and becoming creates another philosophical tension.

If reality is generative and historically evolving, the structures that persist across transformation may themselves emerge, change, or disappear.

GR therefore treats invariance as horizon-dependent.

A structure may satisfy

$$I_t = I_{t+\Delta t}$$

over one temporal domain while undergoing

$$I_t \longrightarrow I_{t'}$$

over a longer history.

The existence of temporally limited invariance does not diminish its epistemic significance. It specifies the regime under which the structure persists.

This prevents the search for symmetry from becoming a search only for eternal and immutable forms.

A generative reality may possess:

persistent structures, emergent structures, broken structures, historically transient structures.

The epistemology of reality therefore requires both invariance and transformation.

9.15 Reality without Final Representation

Cross-relational invariance also weakens the need for a final privileged representation.

Suppose several manifestations differ:

$$x_a \neq x_b \neq x_c,$$

while preserving a structure I .

The epistemic achievement need not consist in selecting one manifestation as the uniquely correct picture of reality.

Knowledge can instead concern the structure preserved through their differences.

This suggests a form of realism compatible with representational plurality:

Reality can constrain knowledge without requiring that any single historically available representation exhaust the form of that constraint.

The possibility is particularly important when radically heterogeneous systems are compared.

Human mathematics, natural language, historical cosmology, and possible non-human cognition may all remain partial modes of access even where some cross-relational structures survive among them.

9.16 Epistemic Commitment without Ontological Closure

The framework therefore permits strong epistemic commitment without requiring final ontological closure.

A candidate invariant can accumulate evidence across increasingly heterogeneous transformations. Its robustness profile can improve.

Alternative manifestation-specific explanations can become less plausible.

The structure can become indispensable to successful prediction, coordination, explanation, or intervention.

At each stage, stronger commitment may be rationally warranted.

Yet the distinction

$$X^* ; x_{a,t}$$

remains.

This is not permanent skepticism. It is a separation between warranted epistemic confidence and claims whose metaphysical burden exceeds the evidence currently available.

The resulting stance can be summarized:

GR permits confidence to grow through cross-relational persistence while keeping the ontological meaning of that persistence open to stronger evidence, new relational systems, and future conceptual reconstruction.

9.17 Revisability of Reality Claims

Ontological interpretation must therefore remain historically revisable.

Let

$$\mathcal{O}_t(I)$$

denote the ontological interpretation assigned to an invariant at time t .

New manifestations or transformations can produce

$$\mathcal{O}_t(I) \longrightarrow \mathcal{O}_{t+1}(I). \tag{50}$$

Revision may strengthen realist commitment, restrict the domain of the invariant, reinterpret it as an access-dependent structure, or reveal several previously conflated invariants.

The history of ontology can therefore be understood partly as the history of changing interpretations of structures that survived, failed, or were newly made visible through changing relations of access.

This historical dimension is consistent with the broader GR principle that analytical vocabularies remain revisable.

9.18 A Generative Epistemology of Reality

The preceding argument produces a generative rather than static model of epistemic realism.

Manifestations arise under relational conditions.

Comparisons generate candidate invariants.

Invariants reorganize subsequent inquiry.

New inquiry generates new conditions of manifestation.

These conditions can preserve or destabilize earlier invariants.

Ontological interpretation changes accordingly.

The process can be summarized as

$$x_t \rightsquigarrow \mathcal{I}_t \rightsquigarrow K_{t+1} \rightsquigarrow \mathcal{C}_{t+1} \rightsquigarrow x_{t+1}. \quad (51)$$

Reality claims therefore possess trajectories.

They are generated through encounters, stabilized through cross-relational tests, and revised when later modes of access expose new structures or new differences.

This generative structure gives epistemic humility a positive form. Humility does not require withdrawal from claims about reality. It requires keeping the conditions and histories of those claims visible.

9.19 Provisional Answer to the Symmetry Question

The paper can now offer a provisional answer to its subtitle.

Cross-relational inquiry can establish symmetry or invariance within formal representations.

It can identify robust structures across heterogeneous relational manifestations.

It can show that some structures persist through changes in observer, language, instrument, history, scale, or conceptual grammar.

Such persistence can progressively strengthen the case that the structure exceeds the peculiarities of the particular manifestation systems tested.

The strongest ontological conclusion remains conditional.

Reality may possess structures whose traces appear as cross-relational invariants, but cross-relational invariance alone cannot determine whether the symmetry belongs to reality itself, to recurrent conditions of access, or to the relation through which reality and access become mutually constrained.

The open character of this answer is substantive rather than evasive. It identifies precisely what has been established, what has become more credible, and what remains underdetermined.

9.20 Boundary of Epistemic Commitment

The present framework therefore stops at a defined boundary.

It permits claims about:

- structures preserved under specified transformations;
- the relational conditions under which preservation occurs;
- the heterogeneity and independence of manifestation systems;
- the robustness accumulated through successful comparison;
- the failures and boundaries of candidate invariants;
- the metaphysical interpretations compatible with the available evidence.

It does not supply direct access to reality outside every possible relation.

Nor does it require such access for epistemic progress.

The contribution is a disciplined transition from relational manifestation to increasingly robust structural knowledge, together with an explicit account of where ontological inference begins to exceed the comparison itself.

The epistemology of reality is therefore neither the possession of a final representation nor the abandonment of reality to inaccessible metaphysics. It is the continuing reconstruction of what survives, what changes, and what those patterns of persistence and difference permit us to infer.

The next section turns from this positive account to the conceptual boundaries and research obligations required for cross-relational invariance to remain a disciplined and revisable research programme.

10 Conceptual Boundaries and Research Obligations

This section specifies the conceptual boundaries and research obligations of cross-relational invariance. The framework developed in the preceding sections creates several opportunities for epistemic gain, but it also introduces new sources of error. Transformations can manufacture apparent correspondence, comparison spaces can suppress difference, shared conditions can produce invariant error, and increasingly abstract invariants can acquire an appearance of universality that exceeds their evidential basis.

The purpose of this section is therefore critical. Cross-relational invariance should remain a revisable research procedure whose own mappings, categories, and standards are exposed to the same relational analysis applied to the phenomena under investigation.

10.1 Provisional Status of the Framework

Cross-relational invariance is proposed as an epistemological framework rather than a completed universal theory of knowledge.

Its principal concepts—manifestation, transformation, comparison space, invariant, relational variation, and epistemic robustness—are provisional analytical devices. Their usefulness depends upon whether they permit distinctions and comparisons that improve inquiry within particular domains.

The framework therefore remains subject to revision:

$$\mathcal{F}_{\text{CRI}}^{(t)} \longrightarrow \mathcal{F}_{\text{CRI}}^{(t+1)}.$$

Revision may concern the formal vocabulary, the classification of transformations, the definition of invariance, the relation between robustness and epistemic commitment, or the distinction among different domains of reality.

Cross-relational invariance should be treated as an instrument of inquiry whose own categories remain available for reconstruction.

10.2 Specification of the Manifestation System

Every claim of cross-relational invariance presupposes some account of the systems whose manifestations are being compared.

A label such as “modern science,” “Daoism,” “Buddhism,” “human perception,” or “Western thought” generally identifies a domain far too heterogeneous to function as a well-defined relational system without further specification.

The relevant system may need to be delimited through historical period, community, text, instrument, experimental procedure, scale, conceptual grammar, institution, or practical setting.

Research Obligation 10.1 (Manifestation-system specification). A cross-relational analysis should specify the relational systems whose manifestations are being compared and identify the conditions of access relevant to the comparison.

This obligation is especially important in comparative historical and religious inquiry, where broad civilizational labels can conceal substantial internal variation.

10.3 Selection of Cross-Relational Transformations

The transformation

$$G_{ab}$$

is not given automatically by the existence of two manifestation systems.

Researchers construct or justify the correspondence through translation, calibration, formal reconstruction, functional comparison, historical interpretation, or another procedure.

Different transformations can generate different candidate invariants.

This creates a danger of circularity. An investigator may select the mapping that preserves the structure already expected to be universal.

Research Obligation 10.2 (Transformation justification). Every cross-relational transformation should state its domain, evidential basis, intended preserved structures, direction, known losses, and reasons for preferring it over plausible alternatives.

Where several defensible transformations exist, the stability of the candidate invariant across those alternatives becomes an additional epistemic test.

10.4 Construction of the Comparison Space

The comparison space $\mathcal{Z}$ is another potential source of hidden assumptions.

Two heterogeneous systems often become comparable only after their local structures have been mapped into a more abstract domain. That abstraction can be epistemically productive, but it can also manufacture agreement.

For example, two traditions may both contain something that can be translated as “change,” “cause,” “subject,” or “ultimate,” while the abstraction removes distinctions central to their local organization.

A comparison space should therefore preserve enough difference for the discovery of invariance to remain informative.

Research Obligation 10.3 (Comparison-space reflexivity). The construction of a common comparison space should identify which local distinctions are preserved, transformed, aggregated, or excluded, together with the epistemic consequences of those choices.

The comparison space is part of the method and should never be presented as a neutral vocabulary existing prior to the systems compared.

10.5 Transformation Loss and Abstraction

Every increase in comparability can involve loss.

A coarse comparison may identify a highly general structure across many systems precisely because the transformation has removed most of the dimensions along which those systems differ.

The resulting invariant can remain valid at its chosen level of abstraction, while its interpretation must reflect the information discarded in reaching that level.

Research Obligation 10.4 (Transformation-loss reporting). Claims of invariance should report known or plausible transformation loss and avoid extending conclusions beyond the structures retained by the mapping.

This obligation prevents a weak structural correspondence from becoming an implicit claim of comprehensive equivalence.

10.6 Relevant Variation

The epistemic significance of an invariant depends upon the relational conditions that were actually varied.

Variation in an irrelevant dimension supplies little evidence concerning independence from the conditions plausibly responsible for the structure.

Conversely, persistence under changes that directly target plausible sources of the structure provides a stronger test.

Research Obligation 10.5 (Relevant-variation specification). An analysis should explain why the selected variations are relevant to the candidate invariant and identify important conditions that remain untested.

The distinction between relevant and irrelevant variation is itself provisional and should be revised when new causal or historical dependencies become visible.

10.7 Shared Conditions and Invariant Error

Cross-relational agreement can persist because supposedly heterogeneous systems retain common conditions.

Human embodiment, shared scientific infrastructure, inherited mathematical formalism, common archives, standardized measurement procedures, or institutionalized conceptual categories can all produce residual dependence.

An apparent invariant may therefore reflect the common architecture of access.

Research Obligation 10.6 (Shared-condition analysis). Cross-relational robustness claims should identify important conditions shared by the compared systems and examine whether those conditions could generate the observed persistence.

This obligation is central to distinguishing epistemic robustness from invariant error.

10.8 Epistemic Independence

A plurality of manifestations does not guarantee a plurality of evidential pathways.

Ten analyses can ultimately derive from one dataset. Several cultural descriptions can share a common translation tradition. Multiple scientific models can inherit the same background assumptions. Repeated agreement can therefore exaggerate the effective independence of the evidence.

Research Obligation 10.7 (Dependency reconstruction). The epistemic genealogy of compared manifestations should be reconstructed where relevant so that repeated derivations from common sources are not mistaken for independent cross-relational confirmation.

This obligation becomes particularly important after an invariant has already been institutionalized and begins shaping the conditions under which later evidence is produced.

10.9 Epistemic Entrenchment

A successful invariant can participate in constructing its own future confirmation.

Once incorporated into instrumentation, educational practice, data standards, institutional categories, or research design, the invariant enters later conditions of manifestation:

$$I_t \rightsquigarrow \mathcal{C}_{t+1} \rightsquigarrow I_{t+1}.$$

Such recursion may reflect genuine success, epistemic entrenchment, or both.

The framework therefore requires genealogical attention to the production of later agreement.

Research Obligation 10.8 (Entrenchment analysis). Later confirmation of an established invariant should distinguish independent survival under new relational conditions from reproduction through conditions already organized by the invariant.

This is especially important in social and institutional domains where classification changes the object classified.

10.10 Anthropocentric Boundaries

Human inquiry tests only a limited region of possible relational access.

Cross-cultural diversity can vary language, history, social organization, and conceptual grammar while leaving major features of human embodiment and cognition largely shared.

Claims of unrestricted universality therefore require caution.

The hypothetical non-human case introduced earlier functions as a limiting test for this problem. It asks which structures would remain intelligible if human-specific perceptual and cognitive conditions were substantially different.

Research Obligation 10.9 (Anthropocentric restraint). Claims of universality should specify which human conditions have actually been varied and which remain built into the available comparison architecture.

The purpose is not to imagine arbitrary alien perspectives as evidence. It is to prevent the currently available human epistemic domain from being silently identified with every possible mode of access.

10.11 Historical Reconstruction

Historical comparison creates another layer of mediation.

An ancient or earlier conceptual system becomes available through surviving texts, material remains, transmission histories, translations, later commentaries, scholarly reconstructions, and contemporary analytical categories.

The reconstructed manifestation is therefore conditioned by both the earlier historical system and the later epistemic position.

This is especially significant for comparisons involving Daoist, Buddhist, or other premodern conceptual vocabularies.

Research Obligation 10.10 (Historical reconstruction). Cross-historical invariance claims should distinguish structures supported by historical evidence from structures introduced primarily through the later analytical reconstruction.

Terms such as “system,” “generativity,” “subjecthood,” “causality,” and “symmetry” belong to the contemporary analytical vocabulary and should not be projected backward as though they were the local self-descriptions of historical traditions.

10.12 Translation and Incommensurability

Some relational systems may resist translation in precisely the dimensions relevant to the comparison.

A concept can have no stable counterpart.

A distinction central to one system may be absent from another.

A transformation may preserve function while losing semantic organization.

In some cases, the appropriate result is therefore partial comparability or current incomparability.

Research Obligation 10.11 (Incommensurability recognition). The absence of a justified transformation should be reported as a boundary of comparison rather than repaired through an ungrounded correspondence.

Cross-relational epistemology gains little if every system is guaranteed to be comparable by sufficiently aggressive abstraction.

10.13 Internal Heterogeneity

Named traditions and epistemic systems often contain substantial internal difference.

“Buddhist selfhood,” “Daoist cosmology,” “money,” “modern science,” or “human cognition” may each designate families of configurations whose internal transformations are as significant as their differences from other domains.

A comparison that selects one configuration and treats it as representative of the whole can produce false invariance.

Research Obligation 10.12 (Internal-heterogeneity specification). Comparative claims should identify the particular configuration analyzed and state the limits of generalization to the wider tradition, system, or historical domain.

Cross-relational comparison should therefore proceed from particular configurations toward wider categories rather than presuming homogeneous traditions in advance.

10.14 Power and Epistemic Visibility

The manifestations available for comparison are shaped by power.

Archives preserve some voices and lose others. Institutions authorize some categories and marginalize alternatives. Scientific infrastructure allocates resources unevenly. Translation traditions privilege certain texts. Colonial, political, economic, and academic structures influence which knowledge systems become legible to later inquiry.

The observable epistemic field can therefore represent only part of the possible historical field:

$$\mathfrak{E}_t^{\text{visible}} \subseteq \mathfrak{E}_t^{\text{possible}}.$$

An invariant identified across surviving or institutionally dominant systems may partly reflect selection before comparison begins.

Research Obligation 10.13 (Epistemic-visibility analysis). Cross-relational inquiry should examine how power, preservation, classification, institutional authority, and resource distribution shape the manifestations available for comparison.

This obligation extends robustness analysis from the transformation itself to the historical production of the evidence being transformed.

10.15 Invariant Structure and Normative Value

Epistemic robustness should remain distinct from normative desirability.

A social relation can be highly persistent across cultures and historical periods while remaining unjust.

A political institution can exhibit structural invariance without acquiring ethical legitimacy.

A religious configuration can remain historically robust without becoming normatively preferable.

The inference

$$\text{Inv}(I) \longrightarrow \text{Good}(I)$$

therefore has no general warrant.

Research Obligation 10.14 (Normative separation). Claims concerning cross-relational invariance should distinguish descriptive or epistemic persistence from ethical, political, theological, or soteriological evaluation.

The later development of Generative Relational ethics and judgment requires a separate normative architecture.

10.16 Invariant Structure and Causal Significance

Invariance should also remain distinct from causal importance.

A structure may be preserved across representations without playing a causal role in the system represented.

Conversely, a historically contingent and non-invariant event can have enormous causal consequences.

Cross-relational invariance therefore concerns persistence under transformation, while relational reality concerns participation in generative dynamics.

The distinction developed earlier remains essential:

$$\text{Inv}_{\text{cross}}(X) ; \text{RR}(X).$$

Research Obligation 10.15 (Causal-level separation). An analysis should distinguish evidence that a structure persists across transformations from evidence that the structure causally or generatively participates in the dynamics of the relevant system.

This prevents epistemic invariance from becoming a universal measure of ontological or causal importance.

10.17 Formalism and Epistemic Proportionality

The notation developed in this paper ranges across formal, empirical, historical, and comparative domains. Its interpretation must therefore remain proportional to the evidence available.

In a mathematical or physical setting, G_{ab} , I , and the comparison space may admit exact formal specification.

In historical or comparative religious inquiry, the same notation may serve primarily to specify logical distinctions among domain, transformation, preservation, and loss.

The formal expression should not create an appearance of precision exceeding the underlying evidence.

Research Obligation 10.16 (Formal proportionality). Mathematical notation should be interpreted at the level of precision supported by the domain, and quantitative claims should be introduced only where their variables, measurements, and comparison procedures can be operationally justified.

This obligation applies particularly to robustness profiles and measures of heterogeneity, where conceptual multidimensionality should not be replaced prematurely by a scalar.

10.18 Ontology of the Comparison Space

A subtle problem concerns the status of the invariant itself.

If two manifestations are mapped into a common space $\mathcal{Z}$, the preserved structure belongs immediately to the comparison architecture through which it has been identified.

This leaves open whether the same structure should be attributed to ontological reality.

The common space therefore mediates rather than eliminates the epistemic distance between manifestation and ontology.

A comparison space can reveal transformation-resistant structure without becoming a transparent window onto reality in itself.

This principle prevents the mathematical success of an invariant from silently converting an epistemic construction into an ontological object.

10.19 Ontological Closure

The strongest risk in the framework is the transition from repeated cross-relational success to premature metaphysical closure.

A structure may survive every transformation currently available while future relational systems remain unknown.

No finite family of comparisons exhausts the space of possible modes of access.

The appropriate ontological interpretation should therefore remain proportional to the tested domain.

Research Obligation 10.17 (Ontological restraint). Cross-relational robustness may support increasingly strong realist interpretation, while claims concerning reality independently of every possible mode of access should remain explicitly distinguished from the invariance demonstrated within finite inquiry.

This obligation preserves the distinction between epistemic confidence and ultimate metaphysical determination.

10.20 Failure Conditions of Cross-Relational Invariance

A useful research programme should identify conditions under which its own claims weaken or fail.

For the present framework, important failure modes include:

- transformations chosen primarily to manufacture correspondence;
- comparison spaces that erase the differences relevant to the research question;
- invariants generated by shared distortion or common epistemic ancestry;
- persistent inability to specify the domain in which the proposed transformation is valid;

- cross-relational categories that repeatedly fail when applied to new configurations;
- ontological conclusions whose evidential burden exceeds the robustness established by the comparison.

These failures need not require abandonment of the entire framework. They may force restriction of domain, reconstruction of the transformation, revision of the comparison space, or rejection of a particular invariant.

A recurrent pattern of such failures across domains would provide grounds for more fundamental revision.

10.21 Disconfirmation and Theory Revision

The framework should be capable of learning from cases that resist it.

Suppose a new relational system cannot be incorporated into the existing comparison architecture. Several responses are possible.

The transformation family may need expansion.

The comparison space may require reconstruction.

A previously unified invariant may divide into several local structures.

A category treated as general may prove historically specific.

In some cases, the framework may have introduced distinctions that contribute no explanatory or comparative gain.

Research Obligation 10.18 (Framework revisability). Cross-relational invariance should be revised when new cases systematically expose structures that its current manifestation spaces, transformations, or invariant categories cannot adequately represent.

The development of the framework therefore follows the same general–special–particular recursion applied elsewhere in GR:

$$\mathcal{F}_t \longrightarrow \mathcal{P}_t \rightsquigarrow \mathcal{F}_{t+1}.$$

Particular cases are capable of transforming the general analytical grammar.

10.22 Research Design for Cross-Relational Inquiry

A mature empirical application of the framework would proceed through a sequence of explicit research decisions.

The inquiry would first specify the relational systems and manifestations under investigation. It would then reconstruct their relevant conditions of access, define a restricted comparison domain, justify one or more cross-relational transformations, and construct an explicit comparison space. Candidate invariants would be tested together with transformation loss, shared conditions, alternative mappings, and plausible sources of invariant error.

Subsequent analysis would vary additional relevant conditions and examine whether the candidate invariant survives, fragments, becomes local, or disappears.

Only after this history of relational testing would the analysis move toward stronger epistemic or ontological interpretation.

The methodological sequence can be stated compactly:

Manifestation reconstruction should precede transformation; transformation should precede invariance; invariance should precede robustness assessment; and robustness assessment should precede ontological interpretation.

This ordering prevents later claims from being built into the earlier stages of comparison.

10.23 Research Obligations of Cross-Relational Invariance

The preceding boundaries can be summarized through a set of recurring obligations.

Cross-relational inquiry should specify the systems compared, reconstruct their conditions of manifestation, justify the transformations connecting them, preserve visible transformation loss, defend the comparison space, identify shared conditions and epistemic dependencies, test relevant variation, retain internal historical difference, examine power in the production of available evidence, distinguish invariance from causal and normative significance, maintain formal proportionality, and preserve ontological restraint.

These obligations are cumulative. Meeting one does not substitute for another.

Their purpose is to ensure that the apparent elegance of invariance remains connected to the heterogeneous relational conditions through which the invariant became visible.

10.24 Boundary of the Present Contribution

The present paper establishes a conceptual architecture for cross-relational invariance and develops its epistemological implications. It does not yet provide a universal operational procedure for estimating relational heterogeneity, transformation loss, epistemic independence, or robustness.

Nor does it establish that every domain contains meaningful cross-relational invariants.

Some domains may exhibit strong exact invariance.

Others may support only local or approximate correspondence.

Some may remain partially incomparable.

Still others may reveal that differences themselves carry greater explanatory importance than the structures preserved across them.

The framework is therefore best understood as a research programme for asking which structures survive relational variation, why they survive, where they fail, and what epistemic commitments those histories of persistence and failure can support.

The value of cross-relational invariance lies neither in maximizing symmetry nor in reducing heterogeneous realities to a common structure. It lies in making the conditions of persistence, difference, comparison, and inference explicit enough to remain open to criticism and revision.

With these boundaries established, the final section can return to the question posed in the subtitle and summarize what cross-relational invariance allows us to say about reality, symmetry, and knowledge.

11 Conclusion

This paper has developed cross-relational invariance as an epistemological framework for investigating structures that persist across heterogeneous modes of relational access. The problem begins from a simple difficulty: knowledge is generated through historically situated relations of embodiment, perception, language, instrumentation, conceptualization, institution, and practice, while inquiry frequently seeks claims whose validity exceeds the particular conditions through which they first became available.

The framework addresses this difficulty through a sequence of distinctions. A possible ontological referent X^* is analytically separated from its relational manifestations $x_{a,t}$. Manifestations are

further distinguished from their symbolic and formal representations. Heterogeneous manifestation spaces can then be related through partial and explicitly justified transformations,

$$G_{ab} : D_{ab} \subseteq \mathcal{X}_a \longrightarrow \mathcal{X}_b.$$

Within an appropriate comparison space, cross-relational invariance is identified when a selected structure survives such transformation:

$$I_b \circ G_{ab} = I_a. \quad (52)$$

The significance of this condition lies in the coexistence of difference and persistence. Manifestations may differ substantially in form, vocabulary, scale, historical origin, or cognitive organization while preserving a more limited relational, functional, or generative structure.

Cross-relational invariance therefore offers one route toward objectivity within relationally situated knowledge.

Objectivity can emerge through the persistence of structure across relevant variation in the relations through which reality becomes accessible.

The strength of this objectivity depends upon the history of variation through which the invariant has been tested. Agreement among nearly identical systems provides limited independence from shared conditions. Persistence across different instruments, conceptual grammars, historical periods, scales, cultures, or cognitive architectures tests a wider range of possible dependencies.

For this reason, the paper has distinguished invariance from epistemic robustness. Robustness concerns not only what survives, but also which conditions were varied, which remained shared, how independent the epistemic pathways were, what information was lost during transformation, and which alternative explanations remain available.

This leads to a central methodological sequence:

Manifestation reconstruction precedes transformation; transformation precedes invariance; invariance precedes robustness assessment; robustness assessment precedes ontological interpretation.

The sequence is intended to prevent ontological conclusions from being built into the comparison from its beginning.

The analysis has also clarified the relation between cross-relational invariance and symmetry. Formal symmetry concerns transformations defined within sufficiently specified mathematical or representational systems. Cross-relational invariance concerns structural persistence across potentially heterogeneous manifestation systems. Ontological symmetry makes the stronger claim that corresponding structure belongs to reality independently of the particular modes through which it becomes accessible.

These levels can be represented compactly as

$$\text{Sym}_{\text{rep}} ; \text{Inv}_{\text{cross}} ; \text{Sym}_{\text{ont}} .$$

The gauge analogy is therefore useful within a defined boundary. Gauge theory provides a powerful example of representational variation accompanied by structural preservation. Cross-relational transformations may lack a common state space, global invertibility, group structure, or lossless composition. Their gauge-like character is consequently methodological unless the stronger formal conditions can actually be demonstrated.

The preliminary cases illustrate why these distinctions matter.

Daoist and contemporary formal grammars of change raise the possibility that different symbolic systems may preserve limited structures of generativity without sharing ontology or representation.

Buddhist analyses of selfhood show how failure of invariant entity identity can coexist with persistence of causal, temporal, bodily, or social relations.

Money and credit demonstrate that historically constituted relational forms can acquire persistent generative efficacy while varying substantially across material and institutional manifestations.

The hypothetical comparison with non-human cognition exposes the residual anthropocentric conditions that remain invisible when epistemic comparison is restricted to human observers.

Across these cases, one candidate structure repeatedly becomes visible:

$$\mathfrak{R}_t \rightsquigarrow X_t \rightsquigarrow \mathfrak{R}_{t+1}.$$

A form generated within relational dynamics can subsequently participate in the generation of later relational states. This recurrent structure is a candidate for further cross-relational investigation. Its recurrence across the preliminary cases does not establish its unrestricted universality or its status as an ontological law.

This qualification reflects a broader distinction developed throughout the paper. Relational reality and cross-relational invariance answer different questions. A historically local form can possess substantial generative reality while lacking broad invariance. A highly invariant structure may possess epistemic robustness without playing the same causal or generative role in every system.

Likewise, what varies remains epistemically and ontologically significant.

Cross-relational invariance identifies structures that persist through difference; it does not make difference unreal.

Historically contingent institutions, culturally specific sacred forms, singular events, and local relational configurations may all exert powerful effects while failing to survive wider transformations. The search for invariance therefore complements the study of difference rather than replacing it.

The framework also gives epistemic humility a positive methodological form. Humility does not require suspension of every claim about reality. A structure that survives increasingly heterogeneous and independently generated relational tests can rationally support increasingly strong epistemic commitment. The openness lies in maintaining proportionality between the evidence accumulated and the metaphysical conclusion drawn from it.

This permits the distinction

observer-independence ; relation-independence.

Agreement among observers can establish independence from particular observers while leaving wider relational conditions shared. Cross-relational inquiry progressively varies those conditions. No finite inquiry, however, can exhaust every possible form of relational access.

The question posed in the subtitle can therefore receive a qualified answer.

Reality as epistemically and relationally accessible can exhibit robust structures that survive transformation across heterogeneous modes of access. Such persistence provides increasingly strong grounds for treating those structures as exceeding the peculiarities of particular manifestations. Whether the same persistence establishes symmetry of reality independently of every possible relation remains an open ontological question.

The openness of this conclusion does not leave epistemology empty. It identifies a path by which knowledge can become stronger without requiring a final representation of reality.

Cross-relational invariance transforms relational limitation into an epistemic resource. Differences among manifestations create the variations through which dependence can be tested. Successful persistence becomes evidence. Failure of persistence reveals previously hidden conditions. New modes of access can revise earlier invariants, and established invariants can themselves become conditions of later inquiry.

The resulting epistemology is therefore generative and historical:

$$x_t \rightsquigarrow \mathcal{I}_t \rightsquigarrow K_{t+1} \rightsquigarrow \mathcal{C}_{t+1} \rightsquigarrow x_{t+1}.$$

Knowledge develops through repeated encounters between manifestation, variation, persistence, failure, and reconstruction.

The most productive form of the question *Does reality have symmetry?* may therefore be methodological before it becomes metaphysical. We can ask which structures remain when our relations to reality change, which differences disappear, which differences persist, which apparent invariants were generated by shared conditions, and how the resulting evidence alters what we are justified in saying about reality.

Cross-relational invariance provides a framework for pursuing those questions while keeping both reality and the conditions of knowing it open to further generation.

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