Appendix A: A Structural Formalisation of Similarity Theory, Version 1.4

A.1 Purpose and Scope

This appendix presents a modest structural formalisation of **Similarity Theory** using labelled directed multigraphs. The purpose of this model is not to provide a mathematical proof of Similarity Theory, nor to reduce its philosophical claims to mathematics. Rather, its purpose is to make the internal architecture of the theory clearer, more consistent, and more available for philosophical and academic discussion.

Similarity Theory begins from the view that consciousness is ontologically primary, that relation is the condition through which consciousness becomes knowable, and that structure emerges through relation. In its simplest philosophical sequence, the theory may be expressed as:

consciousness → relation → structure

This appendix offers a structural language for representing aspects of that sequence. It models relations, frames, identity continuity, similarity, dimensions, and cross dimensional interaction in a simplified formal way. The model should be understood as a map, not the territory. It clarifies the relational shape of the theory without claiming to capture the full metaphysical depth of consciousness itself.

This formalisation is therefore best understood as **Version 1.4**: an early structural grammar for Similarity Theory. It is intentionally simple, extendable, and cautious. Its value lies in making the theory's internal relationships more visible without creating false mathematical precision.

A.2 Interpretive Cautions

Before presenting the model, several cautions are necessary.

First, the graph model is a **representation of relational structure**, not the ontology itself. A vertex does not equal consciousness. A vertex is only a formal marker, placeholder, or representational position associated with consciousness in structure.

Second, the mapping from consciousness to structural placeholder is **interpretive and partial**. It is not ontological, exhaustive, or literal. The model does not claim that consciousness is a mathematical object. It only provides a way to represent selected relational features associated with consciousness as they appear within structure.

Third, a Frame of Time is represented here as a graph state, but this does not mean that a Frame of Time is merely a static snapshot. The graph is a structural abstraction. It does not

capture lived experience, feeling, qualitative awareness, value, meaning, or the full metaphysical reality of consciousness.

Fourth, when this appendix uses formal language, that language should be read as an aid to clarity, not as a completed mathematical system. The model is schematic. It does not claim predictive power, empirical proof, or final formal completeness.

Fifth, the philosophical commitments of Similarity Theory remain distinct from their formal representation. The primacy of consciousness, the metaphysical reality of Frames of Time, and the deeper meaning of relation are not reduced to graph theory. They are interpreted through a graph based model for the purpose of structural clarity.

A.3 Basic Structural Framework

For Version 1.4, Similarity Theory may be represented using a **labelled directed multigraph**:

$G = (V, E, \ell V, \ell E)$

where:

V is a set of vertices.
E is a set of directed edges between vertices.
ℓV is a vertex labelling function.
ℓE is an edge labelling function.

In this model, vertices represent formal positions within a relational structure. These positions may be associated with consciousness in structure, identity bearing locations, or relational roles within a frame. Edges represent directed relations between those positions. Labels provide additional meaning, such as the type of vertex or the type of relation.

This model is useful because Similarity Theory is fundamentally relational. It does not begin with isolated objects as final realities. It begins with consciousness and asks how relation gives rise to structure. A graph based model is therefore appropriate because it makes relation visible in the representation.

However, one important point must remain clear: **a vertex is not consciousness itself**. A vertex is only a formal placeholder used to represent a position associated with consciousness within the structural model. Consciousness remains an ontological and philosophical claim of the theory, not a graph element.

A.4 Consciousness, Relation, and Structure

In Similarity Theory, consciousness is not treated as a late product of structure. Rather, consciousness is primary. Structure appears when consciousness enters relation.

In this Version 1.4 model:

Consciousness is represented indirectly through formal positions associated with consciousness in structure.
Relation is represented by directed edges.
Structure is represented by relational configurations of vertices and edges.

A formal position with no edges may be used as a structural analogue for consciousness considered without expressed relation. This does not mean that unrelated consciousness is literally a mathematical point. It only means that, within this model, the absence of expressed relation can be represented by the absence of edges.

The first relation between two formal positions may be represented as the first directed edge between them. This reflects the central philosophical claim that relation is the beginning of knowable structure.

A further clarification is important: **self relation does not require mutual recognition**. A formal position may enter self relation through recognising another, even if the other has not yet recognised it in return. In other words, distinction itself may generate self reflection. Mutual relation may deepen or enrich self relation, but it is not a necessary precondition for it.

Thus:

A vertex without edges represents a formal position associated with consciousness without expressed relation.
A directed edge represents relation.
A self loop may represent a structural analogue of self relation.
A relational configuration represents structure.

This allows the theory's basic sequence to be represented structurally:

consciousness → relation → structure

A.5 Relation Types

For Version 1.4, the model uses a minimal set of relation labels. Too many labels at this early stage would make the model appear more precise than it is. A small set is more honest and more useful.

Let the edge label set be:

LE = {recognition, interaction, memory, self relation}

These may be defined as follows:

Recognition means that one formal position distinguishes or becomes directed towards another in a way that represents awareness, acknowledgement, or relational distinction.

Interaction means that one position affects, influences, responds to, or exchanges relation with another. This is intentionally broad in Version 1.4 and should not be read as a complete model of physical causation, biological exchange, psychological response, or energetic influence. It simply marks directed relational effect within the structural model.

Memory means a structural relation that refers to, preserves, or carries continuity with a previous frame or state. This is a structural analogue of memory, not a claim that memory is literally an edge of consciousness.

Self relation means a reflexive relation in which a position relates to itself. In graph form this may appear as a loop edge, but philosophically it represents only a simplified structural analogue of reflection, self reference, or internal organisation. Self relation may arise from one way recognition because the recognition of another creates distinction, and distinction can allow the recognising position to become aware of itself in relation.

These relation types are not intended to exhaust all possible relations. They are the minimum useful set for Version 1.4.

Later versions may introduce additional relation labels such as transformation, attraction, resistance, care, rupture, repair, or ethical relation. For the first formal model, however, simplicity is a strength.

A.6 Frames of Time as Preserved Structural States

Similarity Theory holds that Frames of Time do not disappear. Each frame remains preserved as part of the total structure of existence. Time, in this theory, is not treated as an independent object, force, or flowing substance. It is better understood as the measurement of difference between states of consciousness, relation, and structure.

In the structural model, a **Frame of Time** may be represented as a labelled directed multigraph:

$$\mathbf{Gt = (Vt, Et, \ell Vt, \ell Et)}$$

where **t** belongs to an ordered set **T**.

The ordered set **T** does not need to be understood as ordinary clock time. It simply indexes frames in a sequence of relational development. Each frame represents a preserved structural state.

The set of all frames may be written as:

$$\mathbf{\{Gt\}t \in T}$$

This sequence should be understood as an accumulating archive. Later frames are constructed as new relational configurations. They may contain additional vertices, additional edges, different labels, different active relations, or more complex relational configurations than earlier frames. However, earlier frames are not edited, overwritten, or deleted. They remain preserved as part of the ordered family of frames.

This is important because it protects one of the core claims of Similarity Theory: change does not erase the reality of prior states. Rather, new states emerge while previous frames remain structurally preserved.

In plain language: what has occurred is not destroyed by what comes after. It remains as part of the deeper archive of relational reality.

A.7 Identity Continuity Across Frames

One of the central problems in philosophy is the persistence of identity. If a being changes across time, in what sense is it still the same being?

Similarity Theory does not treat identity as a frozen essence. Identity is better understood as continuity through transformation. A child, an adult, and an elder are not identical in form, yet they belong to a recognisable continuity. The same principle may apply more broadly to consciousness, memory, death, transformation, and dimensional development.

In the structural model, identity continuity may be represented using an underlying entity set:

U

For each frame **t ∈ T**, there is a partial identity mapping:

$i_t: U \rightharpoonup V_t$

This means that an underlying entity **u ∈ U** may be associated with a vertex in a given frame. The mapping is partial because not every entity must appear in every frame, and not every frame must contain every identity.

Identity continuity occurs when the same underlying entity is associated with formal positions across multiple frames.

For example:

$i_1(A) = a_1$
$i_2(A) = a_2$
$i_3(A) = a_3$

This means that entity **A** is represented by different formal positions in different frames, while still being tracked as the same identity stream.

This is compatible with Similarity Theory because it allows identity to change structurally without disappearing. Identity does not require exact sameness. It requires continuity of relation across frames.

This model has limits. The identity mapping **it: U ⇀ Vt** is a Version 1 convenience. It is not a claim that identity is metaphysically discrete in any final sense. It assumes that identity can be tracked through formal markers, but it does not yet fully model merging, splitting, distributed consciousness, identity rupture, or reconverging identity streams. These require future development.

A.8 Similarity as Partial Structural Resemblance

The word "similarity" must be handled carefully. Similarity Theory does not claim that different things are identical. It does not claim that an atom is literally a solar system, that a cell is literally a civilisation, or that a human being is literally a universe. Such claims would be too crude.

Instead, Similarity Theory claims that structures may resemble one another across different scales, contexts, or rule sets.

In the structural model, similarity may be represented through a partial structure preserving mapping:

σ: Gt ⇀ Gt′

For Version 1.4, such a mapping preserves adjacency, direction, vertex labels, and edge labels where it is defined. It does not need to map every part of one graph to every part of another graph. It only needs to preserve a recognisable substructure.

This is why **partial isomorphism** or **shared subgraph similarity** is more suitable than full graph isomorphism.

A full graph isomorphism would require two structures to match exactly. That is too strict for Similarity Theory. The theory is not about exact repetition. It is about recurring relational configurations.

A partial similarity mapping allows one structure to contain or echo part of another structure.

For example, if Frame 2 contains the relation:

A → B

and Frame 3 contains:

A → B
A → A

then Frame 3 contains the recognition pattern of Frame 2, but extends it through self relation. The structures are not identical, yet there is a recognisable continuity of pattern.

This is the formal meaning of similarity in Version 1.4:

Similarity is partial structural resemblance across frames, systems, scales, or rule sets.

Whether such mappings must always be injective is left open in Version 1.4. In many cases, injective mappings may be useful when comparing preserved substructures. In other cases, non injective mappings may be needed where a more complex structure is simplified into a lower rule set.

A.9 Dimensions as Rule Sets

In Similarity Theory, dimensions are not merely places, spatial layers, or science fiction realms. A dimension is better understood as a **rule set of existence**. It determines what kinds of relations, behaviours, and structures are possible.

In the structural model, a dimension may be represented schematically as a constraint system:

D

A dimension **D** is a set of graph theoretic constraints on allowed vertices, edges, labels, or relational configurations. A frame **Gt** belongs to dimension **D** if it satisfies the constraints of that dimension.

This allows dimensions to be represented not as locations, but as permitted relational grammars.

This representation is intentionally schematic. It does not claim that dimensions are mathematically complete constraint systems in any final sense. Rather, it provides a useful way to model the idea that different forms of existence operate under different relational permissions and limitations.

The examples below are illustrative rule set examples. They are not intended as rigid metaphysical partitions of reality. They show how the theory's dimensional language may be represented structurally in a simplified Version 1 model.

Dimension 1: Existence

Dimension 1 may permit basic existence and minimal physical relation. In this simplified model, it may allow basic vertices and minimal interaction, but not biological growth, agency, memory, or self relation.

This corresponds to inanimate matter such as particles, atoms, molecules, sand, and rocks. These are not dormant in the sense of absolute inactivity. They are active through physical

bonds, forces, and interactions. However, they do not possess biological growth or autonomous agency.

Dimension 2: Growth and Responsiveness

Dimension 2 may allow adaptive relation, growth, environmental response, and structural development. Plants may be understood through this rule set.

A plant interacts with sunlight, soil, water, gravity, temperature, and seasonal change. It responds and grows, but it does not operate with the autonomous agency or symbolic self reflection associated with Dimension 3.

Dimension 3: Agency and Reflective Relation

Dimension 3 allows movement, perception, memory, agency, decision, and self relation. Animals and humans belong to Dimension 3, though they may occupy different layers within that dimension.

This distinction is important. A dog, a human, and a philosopher are not in different dimensions merely because their capacities differ. They are within Dimension 3 but operate at different layers of relational complexity.

In this way, dimensions can be understood as rule sets, while layers describe differences of complexity within the same rule set.

A.10 Cross Dimensional Interaction

Similarity Theory allows for cross dimensional interaction. A higher rule set may act upon a lower rule set, but the lower rule set cannot fully interpret or reconstruct the higher one.

In the structural model, this may be represented as a structure forgetting mapping:

F: Ghigher → Glower

This mapping removes, collapses, or simplifies structural information. It is generally not invertible. That means the lower dimensional structure cannot reconstruct the full higher dimensional structure from its own limited rule set.

The phrase **structure forgetting mapping** is used here in a modest and schematic sense. It is inspired by the idea of forgetful functors in category theory, where certain structure is ignored or left behind when moving from one formal context to another. However, Version 1.4 is not claiming a fully formal category theoretic functor. It is using the idea as a structural analogy for how a richer rule set may be simplified when received by a more limited rule set.

For example, when a human interacts with a plant, the human may act with intention, memory, agency, and symbolic understanding. The plant may register the interaction as light, shadow, pressure, damage, support, water, chemical change, or environmental stimulus. The

plant participates in the interaction, but it does not interpret the human as a human in the human sense.

Structurally, the mapping from the human frame to the plant frame may forget agency, language, symbolic intention, and reflective self relation. What remains is a simplified interaction compatible with the plant's rule set.

A similar example can be seen in animals. A dog may recognise human behaviour with remarkable sensitivity. It may understand tone, routine, movement, emotional atmosphere, and repeated patterns. Yet it does not reconstruct the full human world of law, mathematics, abstract philosophy, or symbolic metaphysics.

This does not make the dog inferior in a moral sense. It simply means the dog operates through a different relational layer within the broader rule set of Dimension 3.

The same principle may apply to humans in relation to higher dimensional structures. A human may encounter something beyond ordinary interpretation and experience it as dream, intuition, anomaly, spiritual perception, symbolic event, or mystery. The lower rule set receives an effect, but not the complete structure of the higher cause.

This provides a possible way to discuss higher and lower dimensional interaction without requiring crude literalism.

A.11 Worked Example: Five Frames

The following simple example is illustrative rather than canonical. It shows one possible structural pattern and should not be read as the only or primary pattern through which relation, identity, and similarity may appear.

This revised example also clarifies an important point: **self relation does not require mutual recognition**. A may develop self relation after recognising B, even if B has not yet recognised A.

Let the underlying entity set be:

U = {A, B}

In this example, **A** and **B** are not consciousness itself as mathematical objects. They are underlying identity markers used to track continuity across frames.

Frame 1: Unrelated Consciousness Represented Structurally

Let:

V1 = {a1, b1}
E1 = ∅

Identity mapping:

i1(A) = a1
i1(B) = b1

Interpretation:

A and B are represented by formal positions with no expressed relation between them. This provides a structural analogue of unrelated consciousness.

This is not absolute nothingness. It is consciousness considered without expressed distinction or relation.

Frame 2: First Recognition

Let:

V2 = {a2, b2}

Edges:

a2 → b2 labelled **recognition**

Identity mapping:

i2(A) = a2
i2(B) = b2

Interpretation:

A is structurally represented as recognising B. Within this simplified example, the first recognition is treated as the first represented relation.

Frame 2 is not a deletion or modification of Frame 1. It is a new preserved relational state.

Frame 3: Self Relation Through Recognition

Let:

V3 = {a3, b3}

Edges:

a3 → b3 labelled **recognition**
a3 → a3 labelled **self relation**

Identity mapping:

i3(A) = a3
i3(B) = b3

Interpretation:

A continues to recognise B. Through that recognition, A also develops self relation. This represents the idea that the recognition of another can create distinction, and distinction can allow the recognising position to become aware of itself in relation.

At this stage, B has not yet recognised A. Therefore, this frame shows self relation arising without mutual recognition.

Similarity:

Frame 3 contains the recognition pattern of Frame 2, but extends it through self relation.

Frame 4: Mutual Recognition Begins

Let:

V4 = {a4, b4}

Edges:

a4 → b4 labelled **recognition**
a4 → a4 labelled **self relation**
b4 → a4 labelled **recognition**

Identity mapping:

i4(A) = a4
i4(B) = b4

Interpretation:

B now recognises A. Mutual recognition begins, but A has already developed self relation through its earlier recognition of B.

This frame captures an asymmetry of development: the first witness may temporarily be one step ahead in reflective relation. However, this does not mean the other position remains permanently behind.

Similarity:

Frame 4 contains the recognition and self relation pattern of Frame 3, but adds B's recognition of A.

Frame 5: Mutual Development

Let:

V5 = {a5, b5}

Edges:

a5 → b5 labelled **recognition**
b5 → a5 labelled **recognition**
a5 → a5 labelled **self relation**
b5 → b5 labelled **self relation**

Identity mapping:

i5(A) = a5
i5(B) = b5

Interpretation:

A and B now both participate in recognition and self relation. This does not imply perfect equality, final symmetry, or fixed hierarchy. It only illustrates that B may develop self relation after recognising A, and that mutual recognition can deepen the relational field.

From this point, A may develop further, B may catch up, B may surpass A, or both may develop in different ways. The graph does not determine the future. It only represents one possible relational sequence.

Similarity:

Frame 2's recognition pattern is preserved within later frames.
Frame 3's recognition plus A's self relation pattern is preserved within later frames.
Frame 4's mutual recognition pattern is preserved within Frame 5.
Frame 5 extends earlier relational configurations without erasing them.

Identity continuity:

A is tracked across frames as:

a1 → a2 → a3 → a4 → a5

B is tracked across frames as:

b1 → b2 → b3 → b4 → b5

This example illustrates one way identity may be represented through changing relational structures, and how later frames can contain, echo, or extend earlier relational configurations.

A.12 What the Model Structurally Represents

This Version 1.4 model can structurally represent several important parts of Similarity Theory.

It can represent:

Frames as preserved graph states.
Relations as directed labelled edges.
Structures as relational configurations.
Identity continuity through mappings across frames.
Similarity as partial structural resemblance.
Dimensions as schematic rule sets or constraint systems.
Cross dimensional interaction as structure forgetting mapping.
Frame preservation as an accumulating archive.
Self relation as a possible consequence of one way recognition, not only mutual recognition.

These are useful structural clarifications. They allow the theory's internal architecture to be discussed with greater clarity.

However, these components are structurally represented, not exhaustively formalised. The model should not be read as a complete mathematical system.

A.13 What the Model Does Not Formalise

The model does not formalise every claim in Similarity Theory.

The following remain philosophical commitments:

Consciousness is ontologically primary.
Consciousness can exist without relation.
Relation is the condition of knowing.
Structure is the expression of consciousness.
Curiosity may drive relational expansion.
Meaning, value, love, purpose, and ethical depth are real features of conscious relation.
Frames of Time have metaphysical reality beyond their representation as graphs.

These claims may be interpreted through the structural model, but they should not be reduced to it.

This distinction is important. If the model tried to reduce consciousness itself to a graph, it would betray the theory it is meant to clarify. The graph is only a representation of relational structure, not the source of consciousness.

A.14 Risks and Limitations

This model has several limitations.

First, it may oversimplify consciousness by associating consciousness in structure with vertices. This must be handled carefully. The vertex is not consciousness itself; it is a formal placeholder within the model.

Second, frames may appear too static. A graph state can represent a preserved structural configuration, but it does not fully capture lived experience, feeling, awareness, intensity, or qualitative presence.

Third, relation labels may appear arbitrary. The labels recognition, interaction, memory, and self relation are philosophically motivated, but they are not derived from a completed mathematical system.

Fourth, the identity mapping assumes that some continuity can be tracked across frames. This is useful, but it may need refinement when dealing with radical transformation, distributed consciousness, identity rupture, merging, splitting, or reconvergence.

Fifth, dimensions as constraint systems may risk becoming too rigid if treated literally. In Similarity Theory, dimensions are conceptual rule sets for understanding existence, not crude boxes into which reality must be forced.

Sixth, the Version 1.4 model does not yet explain the full dynamics of how relations generate new frames. It describes relational states and their preservation, but it does not yet provide a complete generative process.

Seventh, the worked example remains illustrative rather than canonical. It shows one possible sequence, not a universal law requiring all relation, recognition, or self relation to unfold in that exact order.

These limitations do not invalidate the model. They show why it should remain modest. Version 1.4 is a structural aid, not a final theory of everything.

A.15 Future Development

Future versions of this formalisation may develop in several directions.

A more advanced graph model could introduce weighted relations, allowing different relations to carry different strengths, intensities, or degrees of influence.

A dynamic model could describe how frames are generated, not only how they are preserved.

A richer identity model could address distributed consciousness, identity rupture, reconvergence, merging, splitting, and transformation after major structural change.

A category theoretic version may later represent vertices as objects, relations as morphisms, frames as categories or diagrams, and cross dimensional mappings as forgetful functors.

A relational algebra version may help classify entities, frames, relations, dimensions, and similarity mappings more systematically.

Future versions may also examine whether self relation can emerge through different kinds of encounter, including one way recognition, mutual recognition, contrast with non responsive entities, memory, resistance, or rupture.

However, these developments should come later. Version 1.4 should remain simple, readable, and faithful to the philosophical heart of Similarity Theory.

The aim is not to make the theory look mathematical for appearances. The aim is to give its relational architecture a clear structural form.

A.16 Closing Statement

This appendix has presented a first structural formalisation of Similarity Theory. It uses labelled directed multigraphs to represent relations, frames, identity continuity, similarity, dimensions, and cross dimensional interaction.

The model does not prove Similarity Theory, nor does it replace its philosophical foundation. Instead, it shows that the theory possesses an internal architecture capable of structural representation.

This matters because Similarity Theory is not merely a collection of metaphors. Its central concepts relate to one another in an ordered way. Consciousness gives rise to relation. Relation gives rise to structure. Structures persist as frames. Frames may resemble one another through partial similarity. Dimensions constrain what relations are possible. Higher rule sets may act upon lower rule sets in ways that lower structures cannot fully reconstruct.

Version 1.4 adds one important clarification: self relation does not require mutual recognition. Recognition of another may itself create the distinction necessary for self reflection. Mutual relation may deepen, balance, or transform that process, but it is not the required starting point.

In this sense, structural formalisation gives Similarity Theory a bridge between philosophical prose and academic analysis. It does not make the theory complete, but it makes the theory clearer, stronger, and more available for future development.