GOT-V1-2a-1c

Relational Form

The Physical Instantiation and Reachability of Indexed Relation

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Abstract

A finite locus does not encounter reality as total state. It encounters reality through relations in which physical difference becomes available, abstracted, registered, retained, and sometimes redeployed. The Relative Reference Point architecture gives those relations operational form. The physical implication is equally important: an operative access architecture cannot remain merely descriptive. Its distinctions are realised in substrate, and where registration is retained the abstraction by which a relation was distinguished has acquired a physical instance.

The wider structure begins before any local target or locus is specified. Physical organisations arise within histories of interaction, constraint, transformation, and dependence extending beneath the scale at which they become identifiable as particular things. The relational index names this physically real depth and extension of relation. A target is a local ontological subdivision of that index. A locus is the local unit relative to which distinction becomes evaluable. When target and locus couple, their inherited histories condition the encounter, while the coupling itself produces new relations that did not exist as completed properties of either participant alone.

Finite grounding depends upon abstraction. The relational index contains more differentiation than any finite locus can operationally distinguish, and even a local interaction carries more variation than can be retained as stable distinction. Ontic Projection makes some contrast available; Ontic Abstraction classes that contrast into registerable alternatives; Ontic Registration selects an alternative into physical state; and Registered Abstraction State retains the OA-keyed distinction. Abstraction therefore does not sever a locus from reality. It is the means by which physically constrained relation becomes finite enough to be discriminated at all.

RAS remains the primitive retained state. Embodiment is an operational description of its physical significance. In RAS, the abstract distinction established through OA is physically instantiated in a retained substrate state whose present organisation depends upon the prior relation. Retention also changes what the locus can become next. A locus does not meet each later target from zero. Its accumulated retained organisation conditions which differences can become available, which classing regimes can be supported, and which further relations can be stabilised.

Relational Reachability names this derived condition. It is the reference-conditioned capacity of a locus, given its present physical organisation and available scaffolding, to stabilise a target-relative relation as an operational distinction, either immediately or through a physically supported sequence of intermediate relations. Reachability is not a new element of the RRP Set. It is a consequence of the recursive fact that retained and redeployed relations become part of the conditions under which later relations are formed.

This separates physical ingress from relational formation. A target can lie within the Locus Event Horizon, produce signal-bearing contrast, and even support registration while some

higher-order relation remains unreachable for the locus under the present regime. The object can be encountered without yet being discriminable as the relation in question. Conversely, scaffolding can alter reach: instruments, records, language, other loci, and accumulated practices can establish intermediate distinctions through which a previously unreachable relation becomes constructible.

At larger scales, relations tracking the same physically grounded distinction can become distributed across different loci, substrates, abstractions, and times. Relational Form names that wider structure. It may be concentrated in a particular organisation, as in the developmental, chemical, structural, and ecological relations physically concentrated in an apple. It may also extend through memories, photographs, instruments, records, markets, databases, and trained systems whose material carriers differ radically while their relations remain organised around the same target distinction. Relational Reachability describes which parts or extensions of such structure can become locally formable for a particular locus.

Relational continuity can also propagate across substrate. What travels is not a completed semantic object transferred intact from one locus to another. Physical carriers preserve selected contrast; receiving loci couple to those carriers through their own organisation; and related distinctions may then be reconstructed and stabilised locally. Material resemblance is unnecessary, but causal provenance and sufficient relational preservation remain necessary. Propagation therefore depends on reachability at the receiving side.

Relational Form can also precede a particular instance. A tree may carry developmental and regulatory relations capable of producing next year's apple before that fruit exists as a local target. What persists is not an ideal apple hidden inside the tree, but a physically instantiated organisation in which the apple distinction remains supported in potential. This gives a material counterpart to the intuition behind Platonic Form: the form can exceed any one particular without requiring a second object outside the causal world.

Representation is downstream of this structure. A relation can alter substrate, be abstracted, registered, retained, extend later reach, and propagate into other organisations without being intended or interpreted as a representation. Representation becomes possible only where a later relation treats some such distinction as standing for a target, state, class, or relation. Reference-Indexed Realism is therefore physically substantiated throughout: the index is physical, target and locus are local physical cuts within it, coupling is physical interaction, abstraction is physically supported classing, retention is embodied, reachability is constrained by organisation and scaffold, and Relational Form describes how target-tracking relation can accumulate beyond the local event.

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1. The relational index

1.1. Relation before local targets

Physical difference does not begin when a finite locus notices it. Nor does relation begin when an analyst selects an object for inquiry. The world already contains histories of interaction before any particular target is named. Matter has been formed, transported, combined, separated, constrained, heated, cooled, dissolved, bound, broken, reorganised, and incorporated into later structures. Present organisation is therefore never simply present. It is the current condition of a relational history.

The relational index names that physically real structure. It is not an inventory held by an observer and not a semantic coordinate attached to an object after the fact. At full extension, the index is the totality of relations in which physical states, trajectories, constraints, and organisations stand. Any local distinction is made within that prior field. The index is therefore ontically broader than any target selected from it and epistemically larger than any finite path through it.

This matters because ordinary object-language compresses relational depth very effectively. A table, cell, apple, sensor, person, or planet can be treated as a stable object at the scale where that description is useful. The usefulness of the cut does not imply that the object's physical possibility begins at its visible boundary. Its present state depends upon relations extending below the operative scale, backwards through causal history, and outward into conditions that continue to sustain or transform it.

Reference-indexing begins inside that world. The index is not produced by the act of reference. Reference localises a path through relations that already exist, while the act of coupling can itself create further relations. The result is a world in which localisation is necessary for finite access but never exhaustive of the relational structure within which the localisation occurs.[1]

1.2. The depth and extension of the index

An apple gives the point physical depth. At the scale of ordinary perception, the apple appears as a compact biological object with colour, shape, texture, mass, taste, and position. Yet the physical substrate from which that organisation is formed has a much longer history. The carbon, oxygen, calcium, potassium, iron, and other elements incorporated into the tree and fruit arise from physical processes that long precede any biological distinction of apple. Some heavier elements were formed under stellar conditions before entering planetary matter, geological cycles, soils, water, organisms, and eventually the developmental organisation of the tree.

Those stellar and geological relations barely track apple as apple. They do not distinguish this fruit from a pear, a leaf, or an animal. Their relevance lies deeper. They belong to the substrate history without which the later target could not be physically realised. The relational index therefore cannot be reconstructed by tracing only those relations that already resemble the abstraction under present study. It includes relations that are constitutive of possibility even where the later target distinction is not yet operative.

The same structure extends outward once a local organisation exists. The apple enters optical, mechanical, chemical, biological, ecological, commercial, linguistic, scientific, and technological relations. Each new interaction alters the index. Some relations vanish with the event. Some leave physical residues. Some become signal-bearing contrast for another locus. Some enter an RRP pathway, are abstracted, registered, and retained. The index is therefore not a static background against which objects move. It is continually extended by the relations through which physical organisations encounter and alter one another.

Depth and extension should not be confused with accessibility. The index can be physically real without being available as a total object to any locus. Indeed, the Relational Access Principle already prevents such possession. A finite locus can only encounter what becomes available through its own boundary, interface, channel, scale, horizon, discrimination regime, and abstraction. The index exceeds every such access path while remaining the physical ground in which every access path occurs.[2]

1.3. Target and locus as local cuts

Finite inquiry requires localisation within the index. An ontological target is the bounded subdivision whose relations are presently being tracked. The cut does not create the target, and it does not imply that the target's real relations terminate at the boundary chosen for analysis. It establishes the physical organisation to which the present claim is answerable.

The locus supplies the other local cut. Within the RRP architecture, a locus is the unit relative to which distinction is evaluated in the present relation. That formulation is deliberately local. The relevant locus may change when the relation under examination changes, and no distinction available to one locus should be silently transferred to another merely because both participate in a wider system.

The locality of target and locus should not be mistaken for isolation. Both are organisations within the same relational index. The target carries its own physical history. The locus carries another. A human locus brings a body, sensory capacities, prior learning, retained distinctions, current state, and a history of earlier couplings. An instrument brings material design, calibration, thresholds, response ranges, processing pathways, and prior state. A cell brings membrane architecture, receptor distributions, internal chemistry, and a history of regulation. These inherited relations do more than colour an encounter after it occurs. They condition what the next coupling can make available and what further relations the locus can support.

The index is therefore broad, while target and locus are local. Their local specification is what makes a particular relation evaluable. The fact that both remain embedded in a deeper relational field is what prevents localisation from becoming an ontological fiction of self-contained objects. It also prepares a further question that cannot be answered by target specification alone: given the organisation this locus already carries, which target-relative relations can become formable from here?

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2. Finite grounding through relation

2.1. Coupling produces new relation

The histories carried by target and locus constrain an encounter, but they do not exhaust it. When the two become physically coupled, a new set of relations arises through that interaction. The relation between this apple and this visual locus under this illumination, at this position, through this optical path, did not already exist as a completed property stored wholly inside either participant. It is realised in their present coupling.

This point is stronger than saying that the target constrains the observer. Constraint remains necessary, but a physically grounded access relation requires interaction. Target-relative difference must enter a physical pathway capable of affecting the locus. In optical perception, light is emitted or reflected, propagated, filtered, absorbed, and transduced. In measurement, an instrument must couple to the condition it measures. In chemical discrimination, molecular structure must enter a binding or reaction pathway. The path may be weak, indirect, delayed, or multiply transformed, but there is no physical access without some relation in which target-relative difference becomes causally connected to the accessing organisation.

Quantum measurement makes the interaction character of observation especially difficult to ignore, although the general point does not depend upon quantum theory. Measurement is not a view from outside the physical system. A measuring apparatus is another physical organisation entering relation with what is measured. At other scales the perturbation may be negligible for the purpose at hand, but the coupling remains real. The access path is made possible by interaction, not by an observer standing outside causality.

The present relation therefore has a two-way posture. The target constrains what relations can physically occur. The locus constrains what aspects of those relations can become available through its interface and organisation. Their coupling produces the actual local relation from which operational distinction may arise. Because that coupling itself changes the relational structure of the world, the index is not merely inherited by the encounter. It is also extended through it.[3]

2.2. Abstraction as physical grounding

Interaction, however, is not yet finite informational access. A physical coupling can contain more variation than any locus can discriminate, and the relational index contains incomparably more differentiation than any finite organisation can retain as stable distinction. A locus cannot encounter total microphysical state as a usable alternative. Something must make the relation finite enough to become this rather than that.

The RRP Set already supplies the required architecture. Ontic Projection is the available contrast field at the interface under specified reference conditions. Ontic Abstraction is the classing regime by which that available contrast is partitioned into registerable alternatives. Ontic Registration is the event by which one OP-supported, OA-classed alternative becomes selected into state. Registered Abstraction State is the retained OA-keyed token-state produced by that registration. The sequence is not a semantic ladder imposed upon physics. It is the operational relay through which physical relation becomes finite distinction for a locus.

OA carries particular weight in this account. An available field can vary continuously, at multiple scales and along many physical dimensions, without each variation becoming a separately retained distinction. Abstraction establishes a stable cut. Spectral variation can become red rather than green under one regime. Spatial contrast can become boundary rather than background under another. Molecular configurations can become binding rather than non-binding. Voltage ranges can become one code state rather than another. The abstraction need not be conscious or linguistic. It must be physically supported well enough for alternatives to become classable within the relevant relation.

Abstraction therefore grounds rather than weakens finite realism. Without it, a locus would be immersed in changing physical variation without a stable basis for preserving relational identity across time. The alternative to abstraction is not perfect access to reality. For a finite locus, it is failure to stabilise a distinction at all. The world would remain physically differentiated, but the locus would have no operative way to retain this relation rather than that one.

The resulting abstraction is neither wholly supplied by the target nor freely created by the locus. The target constrains which distinctions can remain answerable to it. The locus constrains which differences can enter its available field and which classing regimes its organisation can support. The present coupling constrains what relation actually occurs. OA stabilises a finite distinction within that jointly conditioned relation. This is why indexed access can be partial without being arbitrary.[4]

2.3. Registration, retention, and embodied abstraction

Once available contrast has been abstracted into alternatives, registration gives the abstraction a physical consequence. OR selects one OP-supported, OA-classed alternative into state. Where that state persists as the relevant OA-keyed token over the operational horizon, RAS is established. RAS remains the primitive retained state. Nothing further is required to earn retention.

Its physical meaning is nevertheless worth making explicit. OA is an abstraction: a relation under which physical variation is classed as one alternative rather than another. RAS is a retained physical state keyed to that abstraction. The abstract distinction therefore has a physical instance. In this operational sense, the relation is embodied in substrate.

Embodiment is not an additional informational status and does not compete with RAS. It names the physical condition already entailed when an OA-keyed distinction has been registered and retained. A present state now depends upon a prior relation having been abstracted in a particular way. Had the classed alternative differed, the retained state would differ accordingly. The substrate has therefore become historical in a more specific sense than ordinary material persistence: its present organisation tracks a prior distinction.

The distinction from physical residue remains important. Interaction may leave a mark without that mark constituting RAS for the locus under study. A surface may deform, a molecule may change, a trail may remain, or a state may persist while the relevant OP, OA, OR, and retention conditions remain unestablished. Physical history is ubiquitous. Embodied abstraction is narrower because the retained physical state is keyed to an earned distinction.

At small scale the primitive description is sufficient. At larger scales, however, an organisation may contain enormous numbers of retained distinctions whose relations to one another condition future availability, abstraction, and response. Nervous systems, developing organisms, instruments, archives, institutions, and trained computational systems can all become dense physical histories of prior distinctions. Embodiment becomes useful as a reversible description of that organisation precisely because its grounding remains recoverable to the RAS architecture rather than replacing it. The further consequence is that retention changes the conditions of later relation formation: the locus that has retained a distinction is physically different from the locus that had not.[5]

2.4. Relational Reachability

A finite locus does not confront every possible relation from the same starting point. Its present organisation is the accumulated result of prior physical history, including whatever distinctions have already been made available, abstracted, registered, retained, and redeployed. Those retained relations can alter later thresholds, expectations, classing regimes, pathways, and branch-realisation. The locus therefore carries a relational substrate from which some further distinctions are readily formable, some can be built through intermediate steps, and others remain unavailable under the present conditions.

Relational Reachability names this derived relation. A target-relative relation is reachable for a locus where the target can physically support the relevant distinction and the locus, under its present reference conditions and available scaffolding, can stabilise that relation as operational distinction. The burden is joint. The locus cannot stabilise a relation the target does not support, and target structure alone does not guarantee that this locus can discriminate the relation. Reachability therefore belongs to the relation between target, locus, coupling, inherited organisation, and scaffold.

This must be separated from the Locus Event Horizon. The Event Horizon concerns ingress: whether external difference can become signal-bearing contrast capable of entering the access pathway for the locus under the present regime. Relational Reachability concerns formation: whether, once relevant coupling is physically possible, the locus can stabilise the relation in question. A target may be plainly inside the ingress boundary while a higher-order relation remains unreachable. Shape, colour, motion, sound, or repeated response may all be registerable while the organisation required to stabilise a more abstract relation is absent.

The distinction also prevents a false binary between already-known and impossible. Some relations are immediately reachable because the locus already carries sufficient organisation for the relevant contrast to be classed and registered. Others are constructibly reachable: the relation cannot yet be stabilised, but a physically available sequence of intermediate distinctions, retained states, tools, demonstrations, or other couplings can modify the locus until the relation becomes formable. A relation that is unreachable under the present regime may therefore become reachable after the regime changes. Reachability is indexed to a locus, history, scaffold, and horizon; it is not an absolute boundary on what is real or what another locus may access.

The recursive mechanism is already present in the RRP architecture. A retained distinction can become part of the conditions under which later OP fields are parsed, later OA regimes are stabilised, later registrations occur, and later states are redeployed. RSD can make a prior distinction operative in the production of another. The resulting new RAS then changes the locus again. Relational Reachability is the higher-order consequence of this recursion: retained relations do not merely preserve what has already happened; they reshape the space of relations that can happen next for that locus.[6]

This is why high abstraction is historically path-dependent without becoming arbitrary. A modern smartphone can be physically present to a person whose organisation does not yet support the relation smartphone. The locus may register shape, luminosity, sound, touch-response, regularity, and many other distinctions while lacking the intermediate relational structure through which microelectronics, symbolic interface, computation, wireless communication, recorded media, and artefactual function can be compressed into the modern abstraction. The object is not hidden. The higher-order relation is not yet stabilisable from that starting organisation.

The same point applies to a microprocessor or a bacterium. A microprocessor can be handled and visually discriminated without its computational relation being reachable. A microscopic biological target can exist and exert causal effects while remaining outside unaided ingress; an instrument can first alter that access boundary, after which accumulated distinctions, comparison, records, and classing practices may be required before the relation bacterium becomes stabilisable. Instruments and concepts therefore solve different parts of the same problem. One can extend physical access; the other can extend the relational organisation through which accessed difference becomes formable as a distinction.

A transplanted early modern human makes the distinction between biological capacity and historical reach especially clear. Nothing in the claim requires a different kind of brain. Raised inside a contemporary environment, the same broad biological organisation could acquire the intermediate relations through language, education, artefacts, instruments, records, and repeated coupling. What was absent historically was not necessarily organismic capacity for the concept, but the realised relational pathway by which that concept could be constructed. Conceptual possibility is therefore not exhausted by what a nervous system could in principle instantiate. It also depends on which relational routes have become physically available in the world around it.[7]

Relational Reachability should not be turned into a new primitive stage. OP, OA, OR, RAS, and RSD still perform the local work. Reachability describes the historically conditioned range over which that work can be successfully organised for a locus. It also supplies the inward counterpart to Relational Form. The Form can exceed every individual conception; reachability describes which parts or extensions of that target-tracking structure can become locally stabilised from a particular relational history.

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3. Relational Form

3.1. From embodied distinction to Relational Form

A single retained distinction is local. The relational structure associated with a target need not be. The same physically grounded distinction can be tracked through many different relations, and those relations can be instantiated in radically different substrates. Some may be concentrated within the target's own organisation. Others may be carried by loci that couple to it. Others may persist in records, instruments, developmental pathways, institutions, or technical systems. Their physical carriers can be heterogeneous while their relational provenance remains organised around the same distinction. No single locus need be able to reach all of them.

Relational Form names this larger structure. It is the sum total of distributed relations that track the same physically grounded distinction, whether those relations are presently instantiated in a target instance or preserve the physical possibility of such an instantiation. The Form is therefore not another primitive beside RAS. It is a higher-scale description of target-tracking relation once the local architecture is allowed to extend across loci, substrates, and time.

The phrase sum total is ontological rather than epistemic. No finite observer is expected to enumerate every relation belonging to a Form. Indeed, the RRP architecture predicts that such possession will normally be impossible. The point is that the Form is not exhausted by whichever subset happens to be available to one locus. There can be target-tracking relations in the target, in other organisms, in instruments, in physical records, and in future causal pathways that no present observer possesses together.

The Form may be concentrated. A living organism can stabilise a large number of mutually supporting relations within a comparatively local organisation. It may also be diffuse. A target can acquire relations across many observers, media, institutions, and technical systems. Concentration and distribution are therefore properties of how the relational structure is physically carried, not different kinds of Form.

Nor is material resemblance required. A neural state does not have to look like its target. A genetic regulatory organisation does not have to resemble the mature structure it helps produce. A numerical record need not resemble the physical process from which it was obtained. What matters is that the relation remains physically grounded to the same distinction through a recoverable causal path. Relational unity is established by provenance and target constraint rather than by visual similarity.[8]

3.2. The apple as a relational cutaway

The apple makes the architecture visible because it can be followed from deep substrate history through a local access relation and then outward again into distributed form. Begin below the apple. The atoms and molecules that will later participate in the fruit already occupy a relational index. Their histories include stellar, planetary, geological, atmospheric, chemical, and biological transformations. At these depths the apple distinction is not yet doing useful work. The relations belong to the index because they contribute to the physical possibility from which the later organisation emerges, not because they already represent an apple.

A developmental process eventually localises a new organisation. Flowering, fertilisation, cell division, gene regulation, transport, metabolism, growth, water relations, structural differentiation, and environmental coupling produce a fruit. At this point a local target cut can identify this apple. The target is not detached from the deeper index, but the abstraction now gathers a subset of relations into an organisation whose distinction can be tracked at the scale of the inquiry.

The apple itself already concentrates Relational Form. Its present morphology, chemistry, seed organisation, ripening state, tissue structure, damage history, and relation to the tree are not separate descriptions floating above it. They are physically realised relations through which this particular apple exists as the target it is. The concentration is high because many target-constituting and target-tracking relations are organised within one comparatively compact substrate.

Now introduce a locus: a person looking at the apple. The person is another local organisation within the same index. Their body, retinal sensitivities, spatial position, prior learning, retained distinctions, and current state condition what the encounter can become. Light interacts with the apple, propagates through the surrounding medium, enters the eye, and alters the sensory system. A new target-locus relation has been produced.

Only part of that physical relation becomes OP for the locus. Much of the apple's molecular structure, developmental history, infrared emission, microbial ecology, internal chemistry, and future trajectory remains outside the available visual field. Within what is available, OA stabilises distinctions. Spectral relation may become colour; spatial contrast may become contour; local surface variation may become bruise. Whether those distinctions can support the more compressed abstraction apple depends partly on the retained organisation already present in the locus. A person who has repeatedly encountered fruit can stabilise relations that a wholly unprepared locus could not yet form, even where both receive similar immediate optical contrast.

Where the relevant distinction is registered, the locus physically changes. Where retained as RAS, an OA-keyed apple-relative state persists. The abstract relation has become embodied in the locus and can alter later reach. A camera can establish a different path and retain selected optical relations. A spectrometer can stabilise spectral distinctions unavailable to unaided vision. A chemical assay can abstract molecular relations. A botanist can retain developmental distinctions. A market can stabilise exchange relations. A database can preserve classifications. Each path is locally indexed. None possesses the target whole, and each makes different further relations reachable.

The frame can then widen again. The target and locus were local cuts made for a particular relation. The Relational Form of apple can extend through the apple itself, the tree that produced it, organisms that encounter it, memories, photographs, measurements, records, language, markets, databases, scientific models, and computational systems in which apple-

related distinctions have become physically instantiated. These relations do not have to be identical, nor are they all equally reachable from any one locus. They are members of the wider Form insofar as they track the same physically grounded distinction.

The cutaway therefore has a characteristic shape. The relational index extends downward beneath the target. Target and locus localise a particular interaction within it. Coupling creates new relation. Abstraction makes some of that relation finitely discriminable. Registration and retention can embody the distinction. Embodied distinctions alter later reach. The resulting target-tracking relation can then join a Relational Form that spreads outward beyond the local encounter, while every stage remains inside the continuing index.

3.3. Form before instance

Relational Form need not wait for a particular target instance to be present. The apple again provides the clearest case. A tree can carry physically instantiated developmental relations capable of producing next year's fruit before that fruit exists as a local object. Genetic organisation, regulatory pathways, meristem structure, seasonal response, resource transport, hormonal relations, and environmental coupling can preserve a physically supported trajectory in which an apple distinction may later become instantiated.

The future apple is not already present as a hidden miniature. Nor does the tree require a representation of the fruit in anything like the ordinary semantic sense. What exists is an organisation of relations under which that physical distinction remains possible. Destroy the relevant developmental organisation and the branch changes. Preserve it under suitable conditions and the possibility remains materially supported.

This gives Relational Form a potential dimension without turning potential into abstraction detached from substrate. The Form can include relations tracking a distinction that is not presently instantiated as a local target but whose conditions of realisation are already physically organised. Next year's apple is not yet this year's target. The relational conditions by which an apple may emerge are nevertheless already part of the Form.

The point generalises. A seed can carry relations capable of producing a mature morphology before that morphology exists. A developing organ can preserve relations to a later structure. A fabrication process can physically organise the conditions under which a future artefact will be realised. In each case the potential relation must remain physically supported. Mere conceivability is insufficient. Relational Form in potential is causal possibility carried by organisation.[9]

3.4. Relational Form and Platonic Form

This potential continuity gives the comparison with Plato more than rhetorical value. The intuition behind ideal Form begins from a genuine difficulty: no single particular appears to exhaust the larger form. One apple can be red and another green, one sweet and another sour, one ripe and another unripe. The biological organisation that can produce apples persists across individual fruits, and the distinction apple can remain physically supported even when no particular fruit of interest is presently instantiated.

Plato locates the unity exceeding the particular in an ideal Form. Relational Form preserves the intuition that the form is larger than any one instance but locates that larger structure within the causal world. The continuity of apple can be carried through developmental organisation, existing fruit, target-tracking relations in other loci, and physically supported

future possibilities. Nothing in the account requires a second Apple existing outside physical relation.

The comparison is therefore specific. Both positions refuse to identify the form with one particular appearance. They differ on what carries the excess. Platonic Form grounds unity beyond its physical instances. Relational Form grounds unity in the distributed physical relations through which the distinction is instantiated, tracked, preserved, corrected, and remains capable of further instantiation.[10]

This difference also makes Relational Form dynamic. New relations can become part of it. Existing relations can decay. A target can be tracked more accurately through improved instruments or abstractions. False relations can persist physically without thereby becoming properties of the target. Potential instances can close when the organisation supporting them is destroyed. The Form is therefore not a perfect and immutable template. It is a real, distributed, causally maintained relational structure.

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4. Relation before representation

4.1. Causal evidence before representation

Once relation is allowed to take physical form, representation no longer needs to carry the foundational burden. A physical relation can alter a substrate without the substrate standing for anything to another locus. A scar can remain because an injury occurred. A path can become easier to traverse because repeated movement altered the terrain. A tree can retain developmental organisation through which fruit will later be produced. A trained model can differ because earlier data changed its parameters. In each case the present organisation is causally conditioned by prior relation before any question of representation is asked.

Where the stronger RRP conditions are satisfied, the relation becomes more specific. OA stabilises a distinction, OR registers an alternative, and RAS retains the OA-keyed state. The retained organisation is then causal evidence of a prior distinction-conditioned relation. Its present form depends upon that relation having taken one course rather than another.

Representation becomes possible downstream, when a later relational regime treats an embodied distinction as standing for a target, state, class, event, or relation. A photograph can function representationally because preserved optical distinctions are later encountered under an appropriate regime. A written word can invoke a wider relational structure because linguistic distinctions have been stabilised across writers, readers, materials, and practices. A scientific record can represent a measurement because the record is embedded in calibration, procedural, and interpretive relations that connect it to a target. In each case, successful representation also presupposes reachability at the receiving locus: the carrier must encounter an organisation capable of stabilising the relevant relation.

The ordering matters. Representation does not make the causal relation real. The causal relation makes representation possible. A representation may also fail: it may preserve the wrong distinction, be misread by a later locus, or be disconnected from the target it purports to track. A carrier can be present while the intended relation remains unreachable for the receiver. Relation therefore supplies the physical ground against which representation remains answerable.[11]

4.2. Relational continuity and propagation across time and substrate

A relation does not need to preserve its original material carrier in order to remain part of a target-tracking structure. Optical relation can become retinal state. Retinal and neural activity can contribute to retained memory. Memory can contribute to speech. Speech can alter marks on paper or digital records. Those records can become inputs to later systems. Training can alter a computational organisation so that a future prompt is processed differently because the earlier chain occurred.

The carriers may become increasingly unlike one another. Material resemblance can disappear while causal provenance survives. This is why a memory need not look like an apple, a genetic sequence need not resemble a fruit, and a model parameter need not resemble either. What must survive is enough relational structure for the relevant distinction to continue constraining later relations.

Preservation is therefore selective. At every transformation some distinctions survive and others disappear. A photograph preserves certain optical relations while losing taste, smell, mass, and most temporal structure. A word compresses even more aggressively. A chemical measurement may preserve a relation unavailable to ordinary perception while discarding the visual form entirely. No carrier is required to reproduce the target whole.

This selective continuity is not a defect added by representation. It is the general condition of finite relation. Signal already preserves contrast rather than total state. OA already classifies available contrast rather than carrying the whole OP field into registration. RAS retains an OA-keyed distinction rather than the complete history that produced it. Relational Form extends the same architecture across longer and more heterogeneous chains, while Relational Reachability explains why the same carrier can reopen different structures in different receiving loci.

Relational propagation names this continuity across transformations. It does not require that a completed relation, concept, or meaning travel intact through space. A source relation alters a carrier; the carrier preserves selected contrast through some physical pathway; another locus couples to that carrier; and, where the receiving organisation can support the required classing and registration, a related distinction is stabilised locally. What persists across the chain is causal provenance and sufficient target-relevant constraint, not identity of material state or representation.

Propagation can therefore fail at several distinct points. Contrast may be lost in the carrier. The carrier may never reach the receiving interface. The receiving locus may register the carrier while lacking the relational organisation required to reconstruct the target-relevant distinction. An intermediate abstraction may distort what is preserved. A later RAS may remain inert rather than being redeployed. These are different failures, and collapsing them into the statement that information was or was not transmitted hides the architecture that matters.

The relation has travelled when a later physical organisation differs in a target-relevant way because earlier relations occurred. That travel may involve many transformations and many loci. Its provenance can become difficult to reconstruct, but difficulty of reconstruction does not make the carrier immaterial. The later organisation remains a physical consequence of the chain through which it arose. Where the later organisation also changes what relations can subsequently be stabilised, propagation has altered not only what the locus carries but the range of relations it can reach next.[12]

4.3. Accuracy, error, and target constraint

A physically real relation is not automatically an adequate relation to its target. This distinction becomes essential once Relational Form is distributed across many loci and representations. Someone may falsely believe that apples grow underground. That belief can be physically retained, communicated, recorded, and made consequential. It therefore belongs to the causal relational history surrounding apple. Its existence does not make underground growth a property of apples.

Reference-indexing preserves the difference between reality of relation and adequacy of target-tracking. The retained belief is real as a state of the locus. The linguistic record is real as a physical carrier. The causal effects of the error can be real. The proposition remains poor as a model of the target because the target constrains which relations can survive correction.

Relational Form therefore cannot be defined as the set of only true relations. Error is itself part of the distributed causal structure by which a target is encountered and represented. What the target supplies is the condition of corrigibility. Some relations will withstand additional access, comparison, measurement, and cross-locus correction better than others. The Form can contain conflict because the relations within it are not guaranteed to be equally adequate.

This is another reason no perfect observer is required. Objectivity does not depend upon one locus possessing the completed Form. It depends upon relations remaining answerable to the target and open to correction through other indexed paths. The larger relational structure can therefore be objectively constrained while every local access remains partial.[13]

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5. Reference-Indexed Realism in physical form

5.1. The two-way realist posture

Reference-Indexed Realism can now be read as a physical posture rather than only a discipline of claims. The relational index comes first. Within it, target and locus are localised. Their coupling produces new relation. Some target-relative difference becomes available at the interface. OA stabilises a finite abstraction. OR makes one alternative physically consequential. RAS retains the OA-keyed state. Retained organisation conditions what later relations are reachable, and the resulting target-tracking relations can become part of a wider Relational Form and part of the index from which later relations proceed.

The target is therefore neither a passive source of completed content nor a construct of the locus. It is a physically real subdivision of the index whose organisation constrains the relations that can be sustained. The locus is neither a transparent window nor a free interpreter. It is another physically constituted organisation whose boundaries, channels, scales, histories, and abstraction regimes constrain which target relations can become available.

Their relation is two-way because both sides matter and because the coupling itself has ontic consequence. The target constrains the interaction. The locus constrains the accessible path and the classing regimes its present organisation can support. The interaction produces a new relation. Where that relation is registered and retained, the world now contains a physical state that did not exist before the coupling. That state can modify later reach. Reference-

indexing is therefore not merely a label attached to an already completed observation. It is the physical architecture through which finite relation is realised and recursively reorganised.

This gives a more exact sense to the claim that the relation is relative while the constraint is real. Relativity identifies the local path through the index. Constraint identifies the physical conditions that path cannot violate without losing adequacy. Reachability adds history: which further paths can become available depends partly on the organisation produced by earlier paths. None of these terms licenses arbitrariness. The local relation is possible because a finite locus participates physically in a wider relational world that both enables and constrains what can be formed.

5.2. Relational Form, reachability, finite model, and residual

The distinction between ontological target, Relational Form, Relational Reachability, finite model, and residual remains necessary. The target is the local ontological organisation being tracked. The Relational Form is the distributed physical structure of relations tracking the relevant distinction. Relational Reachability is indexed to a locus and concerns which target-relative relations can become stabilisable from that locus's present organisation under available scaffolding. A model is a finite abstraction constructed through some reachable subset of those relations for a locus or inquiry.

This ordering explains why relational richness does not yield complete ontology. The distributed Form may contain relations unreachable for the present locus, relations that have not yet been discovered, relations preserved only in inaccessible substrates, potential relations that have not yet been realised as instances, and erroneous relations whose correction remains unfinished. Some of those relations may be constructibly reachable through instruments, training, records, or changed conditions; others may remain outside the current regime. No finite model can simply absorb the whole structure without reproducing the problem of total possession that Reference-Indexed Realism rejects.

Residual therefore remains constitutive rather than embarrassing. It marks what the present model has not closed: inaccessible target structure, unresolved relational conflict, unmeasured dimensions, unavailable scales, uncertain provenance, and relations whose reachability has not yet been established. Relational Form makes this residual easier to understand physically. The excess over the model is not merely an abstract unknown. Much of it can consist in real relations that are present elsewhere in the index or Form but unavailable through the current path.

Reachability also gives residual an explicitly dynamic edge. A missing relation need not be treated as permanently inaccessible merely because the present locus cannot stabilise it. An update may come from a new interface, an instrument, a newly retained intermediate distinction, another locus, a record, a better abstraction, or a changed scale. The condition of finite access is therefore neither complete possession nor fixed ignorance. It is corrigible movement through a relational structure whose future accessibility can itself change.

The distributed structure explains how correction becomes possible. Another locus can couple to the same target through a different interface. An instrument can stabilise distinctions unavailable to unaided perception. A later experiment can expose a relation absent from earlier models. A record can preserve a prior state against which current claims are compared. Objectivity emerges through disciplined relation among partial paths, including paths that extend one another's reach, not through escape from indexing.[14]

5.3. The physical ground of observation

The later theory of Observation requires its own discriminator, but its physical ground is already visible here. An observer cannot begin with an unmediated target. Before bounded registration can earn technical observational status, there must already be a relational index within which a target and locus can be localised, a physical coupling through which target-relative difference can become available, and an abstraction under which that availability can become a stable alternative. The locus also arrives with a retained organisation that conditions which abstractions are presently reachable.

This is why abstraction is not secondary to observation. Without abstraction there is no stable distinction to register. A finite observing system cannot preserve every physical variation generated by its interaction with a target. It must operate through a cut under which some differences become equivalent, some become alternatives, and others remain outside the operative regime. Observation is possible only because relation can be compressed without being severed from its physical ground. But reachability should not be collapsed into observation: a target may be registered under one distinction while another relation to the same target remains unstabilisable for the locus.

The pre-observational architecture is therefore continuous with the RRP Set. The locus encounters a target through a physical relation. OP makes some contrast available. OA makes the relation classable. OR can register an alternative, and RAS can retain the resulting state. Paper 4 can subsequently determine when such bounded registration earns the technical status of Observation, how observer-locus and Observer should be attributed, and what record provenance is required. None of those later burdens needs to be imported here for the physical scaffold to be complete.

The consequence is important. Observation does not ground an otherwise unconnected observer to reality by representation. Physical relation comes first. Abstraction stabilises that relation into finite distinction. Registration then gives the distinction a state. Retention can alter what becomes formable later. Observation, when later earned, is a specialised status within a relational architecture that is already physically connected to its target and historically conditioned by prior relation.[15]

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6. A Part 2a cutaway

The hot cup: preserved relation through transformation

A hot cup placed upon a table provides a compact way to bring the Part 2a architecture into one continuous physical history. Water is heated, the water alters the thermal state of a cup, the cup is carried across a room, and its base is placed upon a table. Heat crosses the contact interface. Moisture may collect or escape around the base. Pressure is transferred through the contact region. The material organisation of the surface responds. After the cup is removed, a thermal footprint may remain for a short interval; under suitable material conditions, heat, moisture, or both may also leave a much more persistent ring.[16]

Nothing outside ordinary physical causation has been added. The entire chain remains lawful physical state evolution. Energy is transferred, matter is redistributed, gradients form and dissipate, and later states remain causally dependent upon earlier ones. In the broad computational sense inherited from Part 1, the pathway is continuous with Trivial

Computation. The fact that an external description can follow the sequence does not by itself establish Non-Trivial Computation within the table, cup, or thermal path.

Signal provides the physical continuity through which selected contrast survives transformation. A signal path does not carry a source whole. It preserves some differences through changing physical carriers while other differences are degraded, merged, or lost. Where a segment of that path is specified through alternatives, channel conditions, noise, and discrimination, Shannon mathematics may characterise transmission and discriminability within that regime. It does not measure abstraction itself, nor does the transfer of energy alone establish operational information for a locus. The signal layer identifies how physical difference can remain sufficiently structured to enter a later RRP-indexed relation without treating every physical interaction as informationally equivalent.[17]

The geometry of the cup base gives the simplest example of preservation. Its shape constrains the region through which pressure, heat, and moisture couple to the surface. That contact geometry in turn constrains the spatial organisation of the resulting thermal field and any later material alteration. A circular ring can therefore remain physically related to a circular cup base even though no cup-shaped object has been transferred into the table. The relation survives while the carrier changes.

Other relations do not survive in the same way. The kettle may have been manufactured by a particular company and carry a visible brand. That branded kettle can belong genuinely to the causal provenance of this event: this kettle heated this water. But if differently branded kettles produce equivalent downstream thermal conditions, and the distinction between those brands leaves no discriminable difference through water, cup, contact, and table, then brand identity has disappeared from the retained path. The causal history remains real while the differentiating relation has been lost.

The colour of the person's socks occupies a different position. It may belong to the wider circumstances in which the event occurred, but if sock colour never modulates heating, carrying, placement, contact, or surface alteration, then that distinction was not compressed out of this pathway. It never entered the operative path in the first place. A later absence can therefore have different causes: a distinction may survive, it may belong to the provenance while losing discriminability through transformation, or it may never couple into the path being traced at all. The present state of the table carries neither the total event nor an arbitrary fragment of it. It carries those relations that the physical history actually preserved.

The table-surface relation can now be read through the RRP architecture without adding a later interpreter. The relevant Relative Reference Point is local to the surface, the cup-table interface, the operative scale, the material response of the finish, the duration of contact, the thermal and moisture conditions, and the horizon over which a resulting state is claimed to persist. Within that relation, the spatial, thermal, moisture, and pressure differences made available across the contact region constitute OP. The material regime supplies OA by treating some of that continuous variation as equivalent and other variation as distinct: exposed rather than unexposed, heated rather than background, sufficiently wetted rather than insufficiently wetted, or inside rather than outside the effective contact footprint.

OR occurs when this particular placement selects one of those available, classed alternatives into the state of the surface. Where the resulting OA-keyed state remains identifiable over the relevant operational horizon and reference scale, the table carries a RAS. Persistence alone would not be enough: the retained state is a RAS because its present organisation remains keyed to the earlier OP, OA, and OR relation. Once that relation is physically established,

however, no later person is required to confer it. The abstraction is already instantiated in the state of the table.[18]

The hot cup can leave more than one retained relation, and those relations need not follow the same trajectory through state-space. A thermal footprint can preserve cup-relative spatial distinction while the temperature field remains discriminable from its surroundings. A chemical or structural ring can preserve related geometry through a much slower dissipative pathway. What remains available for minutes under one scale and threshold may remain available for years under another. The heat, the ring, the table, and the chain of transformations remain non-zero components of the continuing causal history even when a particular relation falls outside the present access conditions. Loss of availability at a stated scale, horizon, or discrimination threshold is not ontological disappearance.

The retained trace as a new access path

The retained table-state can later become the target condition of another relation. The RAS remains physically instantiated whether or not another locus encounters it. When a person later couples to the table, those differences in the retained state that fall within that person's boundary, interface, scale, horizon, and discrimination conditions constitute the OP of the new relation. Other differences can remain physically present while lying outside that access path. The person's existing organisation then supplies classing relations through which some available contrast becomes edge rather than background, circular rather than irregular, stain rather than normal finish, or recent warmth rather than ambient surface. OR can register a classed alternative, a further RAS can retain it, and RSD may later redeploy the retained distinction.

Nothing has passed intact from table into person. The table's retained state has entered a new physical coupling in which selected relations are again preserved, classed, registered, and retained. The same history can therefore cross radically different substrates without requiring material resemblance between successive carriers. What survives is constrained causal relation, not a completed semantic object moving unchanged from one location to another.

The receiving locus nevertheless changes what can be reconstructed. A dog may discriminate the ring, residual odour, moisture, or thermal difference, including relations that are unavailable or less salient to a human. Those are genuine indexed relations to the same retained state. The dog's present organisation need not, however, support the further abstraction that a drinking vessel was placed there, that the vessel probably contained something hot, or that a person carried it from another location. A human can support those further relations where cups, tables, circular bases, hot drinks, placement, surface marks, and human action already participate in the retained organisation brought to the encounter.

The target constrains both loci without fixing identical access for either. What can become stabilisable depends jointly upon the relations retained in the target state, the physical access path, and the relational organisation already present in the receiving locus. Relational Reachability is visible here without becoming a new primitive stage. The ring can make one relation immediately formable, another reachable only through intermediate retained distinctions, and another unavailable under the present conditions even though the wider causal history remains real.

Reconstruction therefore has a physical gradient without becoming a licence for unconstrained inference. The approximate geometry of prior contact can be closely constrained by the geometry of the trace. Evidence of heat or moisture can be similarly close where corresponding material distinctions survive. A cup-like object may then become a strongly supported reconstruction for a suitably organised locus. A person placing the cup, a

hot drink, or a kettle can become progressively more dependent upon contextual relations and alternative causal paths not uniquely fixed by the ring itself. As abstraction extends farther from the retained discriminator, support becomes more mediated and the space of admissible formulations can widen while the originating trace remains unchanged.

That widening should not be mistaken for replacement of relation by free probability. A probabilistic treatment may later be appropriate where its own conditions are earned, but the prior question remains whether the proposed relation is physically supported by the retained path. The kettle brand cannot be recovered from the ring merely because one brand is considered more likely than another if brand-specific contrast has already disappeared. Sock colour fails more fundamentally because the relevant distinction never entered the path. Residual therefore marks the boundary between what the present trace and justified context can support and what remains outside the current relation.[19]

The stronger causal discriminator can also be located without changing the table's status. The table is not NTC merely because it carries a RAS. If a later retained distinction is redeployed and downstream trajectory depends counterfactually upon that distinction through an appropriate Information Processing Locus under Baseline Dynamics, the inherited NTC relation can be earned in that later organisation. All of these processes remain lawful physical evolution; NTC identifies a causally attributable subdivision of that wider TC history where distinction has become organisation-dependent and counterfactually operative.[20]

From local trace to relational environment

The hot-cup cutaway is deliberately local. Its clarity comes from following one pathway tightly enough to see where contrast survives, where abstraction is physically instantiated, and where later access becomes possible. The same event, however, already belongs to a relational environment vastly larger than the cut used to inspect it. The cup has a manufacturing history. The table has a material and structural history. The water has passed through prior physical systems. The person carries biological, developmental, social, and technical histories. None of those histories needs to survive in the ring for them to remain part of the physical world in which the ring became possible.

The relational index names that wider physical depth and extension. The retained ring is not a miniature index and does not contain the causal world from which it arose. It is one locally retained abstraction within a field of relations that extends beneath the target, beyond the locus, and through histories that no finite access path can recover as a total object. The local success of the cut depends on that excess rather than cancelling it: the trace can constrain a claim precisely because it was produced within a world whose relations are not created by the later locus.

Relational Form occupies a narrower but still distributed region within that wider index. Where relations across different substrates continue to track the same physically grounded distinction, their unity is supplied by relational provenance rather than material resemblance or common storage. The cup itself, the geometry retained in the ring, a memory of the placement, a photograph, a manufacturing specification, or a record of the event can preserve different relations to the same target without any one carrier containing the Form whole. The Form is therefore instantiated across relations that remain answerable to the target distinction, while the index includes the deeper and wider relations through which those target-tracking structures are possible.

Relational availability is the bridge between that larger environment and any finite locus. A locus does not receive the index or a Form as total state. It participates in the same world while gaining access only to those relations that cross its present boundary, interface, scale,

horizon, discrimination regime, and abstraction conditions. Another locus can cut the same target differently. An instrument can extend a channel. A record can preserve a relation beyond the lifetime of an unaided sensory path. A retained intermediate distinction can make a previously inaccessible abstraction reachable. None of these changes creates the target; each alters the route by which some of its relations can become locally available.

Human culture makes the cumulative effect of this architecture unusually visible. Words, diagrams, tools, instruments, records, institutions, technical standards, and practices are physical organisations in which prior abstractions have been stabilised and made available for later coupling. Their significance is not that they contain completed meanings ready to be copied into another mind. They alter the relational environment into which later loci arrive. A distinction stabilised by one locus can become part of the scaffold through which another locus reaches a relation that would otherwise require a much longer or unavailable path.

The resulting informational environment therefore dwarfs every individual participant without becoming a separate semantic realm. The relational index is wider than any local model. Relational Forms distribute target-tracking structure across heterogeneous carriers. Relational availability opens only finite paths through that structure, and Relational Reachability constrains how far those paths can presently be extended from the organisation already carried by a locus. A person, instrument, archive, organism, or institution can preserve real relation without possessing the wider structure that makes its preservation possible.

The finite locus is consequently not outside this environment looking in. Its body, retained distinctions, abstractions, instruments, records, and prior history are themselves organised relations within the same index. Each new coupling can add another retained state, alter later reach, and become part of further target-tracking structure. The wider environment remains inexhaustible not because relation is hidden in a second world, but because physical history and distributed organisation exceed every single route through them.

The local ring and the wider relational environment are therefore two scales of the same account. At the local scale, physical history selects, compresses, and retains relation before any later reconstruction. At the wider scale, those retained relations sit inside distributed Forms and a relational index that no finite locus can possess whole. Availability opens a path through that excess. Reachability governs what can be built from the path. The resulting model can remain physically grounded precisely because it never needs to become complete.

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7. Scale, reachability, and conclusion

7.1. Primitive, embodiment, reachability, and form

The concepts operate at different scales and should retain that separation. RRP localises the reference relation. OP supplies available contrast. OA classes the contrast. OR registers an OA-supported alternative. RAS retains the registered distinction. RSD governs later redeployment where the retained distinction becomes operative in subsequent transition. These remain the primitive architecture.

Embodiment describes what retention means physically. In RAS, the abstract distinction established through OA is not left as an immaterial classification. It is carried by a retained state. The physical carrier is necessary, but the carrier alone is insufficient: the state is

relevant because it is keyed to the abstraction through which the prior relation was discriminated.

Relational Reachability belongs at a derived organisational scale. It does not add a stage between RAS and RSD. It describes what follows when many inherited and retained relations become conditions of later availability and abstraction. Reachability is therefore local to a locus and regime, historical because prior couplings alter it, and scaffold-dependent because external organisations can open physically supported intermediate paths. It concerns which relations can become stabilisable, not which relations exist in the world as such.

Relational Form belongs at the larger scale where target-tracking relations are considered together. It can include embodied distinctions across many loci and substrates, direct constitutive relations within the target, and physically supported potential relations capable of producing later instances of the same distinction. Its unity is not supplied by one carrier, one observer, one representation, one reachability field, or one moment in time. It is supplied by relational continuity around the same physically grounded distinction.

The relational index is broader still. It includes the deep substrate relations through which target, reachability, and Form become possible, including relations that do not themselves track the later target distinction. The index therefore cannot be collapsed into Relational Form or into the organisation carried by a locus. The target is a local cut within the index. Reachability concerns the possible formation of relation for a particular locus. The Form can spread outward from a target and can extend through potential instances. The index remains the physical depth and extension within which all of those relations occur.

These scale relations protect the architecture from inflation. Not every physical residue becomes RAS. Not every physical history becomes an embodied abstraction. Not every inaccessible relation is unreachable in every regime. Not every relation in the index belongs to the Relational Form of the target. Not every target-tracking relation is equally accurate. Not every distributed form implies a distributed locus. The strength of the account lies in allowing higher-scale language while keeping the route back to the primitive relation available.[21]

7.2. Conclusion: relation in form

A finite locus begins inside relation. The physical world already contains histories of interaction, constraint, transformation, and dependence that exceed every local target and every access path through it. The relational index names that wider field. Target and locus are local cuts within it, and their coupling adds further relation rather than revealing a completed content waiting unchanged on either side.

The hot-cup cutaway makes the local consequence visible. A lawful physical history can preserve selected contrast through changing carriers, physically instantiate abstraction in a retained state, and later make part of that history available to another locus. What survives is neither total state nor arbitrary interpretation. It is constrained relation. What does not survive may have been compressed out, may never have entered the path, or may remain physically real while lying outside the present access conditions.

Relational Reachability adds the historical consequence of retention. A locus that has been altered by prior relation does not meet the next target from the same starting organisation. Retained distinctions can change later classing, access, and construction. Relational Form names the larger target-tracking structures that can accumulate across such local paths, while the relational index remains broader than any Form and any finite model built through it.

Relation before representation therefore does not demote representation. It places representation downstream of the physical conditions that make finite modelling possible. A record, image, word, model, or theory can preserve real relation without containing its target whole. Its adequacy depends upon what the relevant path actually retained, what later access can recover, and what residual remains outside closure.

Reference-Indexed Realism is consequently physical all the way down. Reality exceeds every locus without becoming inaccessible in principle; finite access remains possible because relation can be preserved selectively, stabilised materially, and reopened through later coupling. The world contains more relation than any observer can possess. A finite locus remains grounded not by escaping that excess, but by participating in it through paths that stay answerable to the physical history from which they arise.

Endnotes

[1] Series inheritance and compositional scope: GOT-V1-2a-1, headings 1.4, 2.1, 3.1-3.6 and 6.1-6.3, supplies finite relational access, the RRP Set and compounding without new primitives. GOT-V1-2a-1a, headings 1.4 and 4.1-4.4, supplies physical mediation and preserved contrast. GOT-V1-2a-1b, headings 2.2-2.3 and 3.1-3.5, supplies target/model asymmetry and residual discipline. Relational index, embodied abstraction, Relational Reachability and Relational Form are the present paper's compositional formulations of those commitments; they are not attributed verbatim to the earlier papers. These internal citations identify conceptual provenance, not independent empirical validation or a claim of priority over other scholarship.

[2] Illustrative scope: the apple here and in headings 3.2-3.3 is a worked conceptual example, not a reported reconstruction of an individual fruit's history. The inherited relation is physical difference and history exceeding any finite access path: GOT-V1-2a-1, headings 1.1 and 1.4; GOT-V1-2a-1a, headings 2.1-2.4; GOT-V1-2a-1b, heading 2.2. The cited series apparatus does not separately substantiate the stellar-history or detailed developmental examples. Those details must not be treated as newly established empirical results or as evidence supplied by a general information-theory citation.

[3] Series inheritance and bounded comparator: local locus discipline follows GOT-V1-2a-1, headings 2.1-2.2; physical coupling follows GOT-V1-2a-1a, headings 1.4 and 4.3-4.4, and GOT-V1-2a-1b, headings 2.3 and 3.2. Rovelli (2015), already used in Paper 1, endnote 2, is a comparator for relative information between physical systems without subjectivism. That recorded comparison is reused only within this scope. The quantum-measurement illustration does not establish an interpretation of quantum mechanics, import a quantum formalism or identify interaction alone with technical Observation.

[4] Series inheritance and structural comparator: GOT-V1-2a-1, headings 3.2-3.5 and 4.1, governs OP, OA, OR, RAS and abstraction-bound token identity. Barwise and Seligman (1997), already used in Paper 1, endnote 3, provides a neighbouring architecture of classifications, tokens, states and channels. This is a comparator, not the origin of the RRP definitions and not an import of channel theory. The physical-grounding argument remains the present composition of the series architecture.

[5] Series inheritance and physical provenance: GOT-V1-2a-1, headings 3.5 and 4.2-4.3, fixes RAS by its classed registration history rather than isolated carrier state. Landauer (1991), already used in Paper 1, endnote 5, supplies the physical-provenance acknowledgement: embodiment is necessary but insufficient for operational information for a locus. Here embodiment describes the physical significance of an earned RAS; it is not an additional status, and Landauer is not cited as having defined OA, RAS or Relational Form.

[6] Derived composition: GOT-V1-2a-1, headings 6.1-6.3, explicitly allows retained distinctions to condition later OP, OA, OR and RSD without adding primitives; GOT-V1-2a-1a, headings 7.1-7.3, develops recursive signal and redeployment pathways. Relational Reachability names the present paper's higher-order consequence of that organisation. Its distinction from ingress preserves the Locus Event Horizon in GOT-V1-2a-1a, heading 1.4. This is an architectural derivation, not a separately established reachability theorem or a claim that every imagined intermediate route is physically available.

[7] Illustrative scope and evidence limit: the transplanted-person passage is a thought experiment about retained organisation and available scaffolding. GOT-V1-2a-1, headings 6.1-6.2, supplies the architectural relation, not comparative evidence about historical populations, brains or learning outcomes. Its defensible

conditional is that, where a locus can acquire the necessary intermediate distinctions, changing its relational environment can change what becomes formable. No empirical equivalence between populations or guaranteed learning outcome is established by this apparatus.

[8] Derived composition: the move from local retained distinction to distributed target-tracking structure combines GOT-V1-2a-1, headings 4.2-4.3 and 6.1-6.3, with GOT-V1-2a-1b, headings 3.1-3.3. Relational Form is the present paper's higher-scale formulation, not a new RRP Set element and not a definition attributed to an external comparator. The ontological expression 'sum total' does not certify that a finite model enumerates a completed Form. Nor does distribution alone establish a single distributed locus.

[9] Series-grounded composition: GOT-V1-2a-1, headings 2.3 and 3.2, separates supported alternatives from selected occurrence; GOT-V1-2a-1b, heading 5.1, separates possibility from actuality. This paper applies that distinction to physically organised conditions for a later instance. The biological and fabrication examples illustrate the conditional; they are not a new developmental model or a demonstrated prediction. No possible-worlds ontology or external theory of ideal forms is inherited by citing the series.

[10] Scholarly scope limitation: the operative contrast is between an ideal unity beyond its physical instances and a unity carried by distributed physical relations. No particular text or edition of Plato is identified in the supplied cited corpus. Consequently, the attribution to Plato in this passage is not established by the present apparatus. Existing series references concerning mathematical or modal realism are not substitutes for a source on Plato's doctrine. The contrast can stand as a schematic philosophical comparison, but historical attribution requires separate support or explicitly non-historical wording.

[11] Series inheritance: GOT-V1-2a-1, headings 4.2-4.3, and GOT-V1-2a-1a, headings 4.4 and 6.3-6.4, distinguish a physical carrier, preserved contrast and an earned retained distinction. The representation claim here composes those relations: a later representational use does not create the prior physical registration history. It does not follow that every physical residue is RAS or that a carrier is an intrinsic container of completed meaning.

[12] Series inheritance and compositional extension: GOT-V1-2a-1a, headings 4.2-4.4 and 5.2, governs carrier transformation, selective preservation and signal-path failure; GOT-V1-2a-1, headings 6.1-6.3, governs later local registration and redeployment. Relational propagation is the present description of such continuity across successive loci. These citations do not establish that a concept, representation or meaning is copied intact, or that every causal after-effect earns informational status.

[13] Series inheritance: GOT-V1-2a-1b, headings 1.2, 3.1-3.5 and 5.1, distinguishes the reality of an appearance, record or error from the adequacy of its target claim. This supports keeping physically retained error separate from target properties. The inclusion of conflicting target-directed relations within Relational Form is this paper's compositional treatment, not a guarantee that those relations are equally adequate. GOT-V1-2b-2, headings 1.6 and 5.1, provides the downstream knowledge-facet treatment of record-status versus truth-status; it does not redefine the upstream architecture.

[14] Series inheritance and bounded comparators: GOT-V1-2a-1b, headings 3.1-3.5 and 4.3-4.4, governs finite models, residual and correction under target constraint. Giere (2006) and Massimi (2022), already paired in that paper's endnote 8, are reused as comparators for perspectival observation and scientific representation without requiring perspective-free access. They are not cited as defining Relational Reachability or Relational Form. The present account retains its own RRP access scaffold and target/model/residual discipline.

[15] Downstream handoff, not reverse inheritance: GOT-V1-2b-4, headings 1.2, 1.4-1.5, 3.2-3.5 and 4.1-4.3, owns the technical Observation threshold and observer-locus/Observer distinction. GOT-V1-2b-2, heading 3, owns the knowledge ladder; GOT-V1-2b-3, headings 2.2-2.3, owns the intelligence-facet use of the non-trivial discriminator. Paper 1c supplies a compositional physical account, not a substitute route to those statuses. Availability, retention or reachability alone must not be promoted to realised Observation or Intelligence.

[16] Illustrative scope: this cutaway combines the physical-pathway account in GOT-V1-2a-1a, headings 2.1-2.4 and 4.1-4.4, with the RRP Set in GOT-V1-2a-1, headings 3.2-3.6. It is a conditional worked example, not a reported experiment, a universal claim about table finishes or a measured retention-time result. The ring, thermal footprint and receiving-locus comparisons illustrate different paths and retained distinctions under the stated material, scale and horizon conditions. Their empirical applicability would require those conditions to be demonstrated for the actual case.

[17] Existing formal context: Shannon (1948) is already the channel-theoretic source in GOT-V1-2a-1a, heading 3.4 and endnote 3. It is cited here only for the stated possibility of characterising transmission and discriminability once a source/channel, alternatives, noise and discrimination regime are specified. No Shannon calculation is performed in this cutaway. This reuse neither measures abstraction or meaning nor establishes RRP availability, RAS, reachability or NTC. Paper 1a's recorded formal-dependency relation is not automatically transferred to Paper 1c.

[18] Series inheritance: GOT-V1-2a-1, headings 3.4-3.5, 4.2-4.3 and 6.3, and GOT-V1-2a-1a, heading 6.3, govern the distinction between physical persistence and an OA-keyed retained registration. The cutaway's RAS claim is conditional on that local OP/OA/OR and retention relation, not on a later person's interpretation. The later reader or investigator establishes a new access relation; neither later readability nor persistence alone retrospectively proves the earlier RAS conditions.

[19] Series-grounded inference: selective preservation follows GOT-V1-2a-1a, headings 4.3-4.4 and 5.2; bounded reconstruction follows GOT-V1-2a-1b, headings 3.3-3.5. Under the example's stipulated conditions, a feature that leaves no discriminable difference in the retained path cannot be identified from that path alone. Independent context is a separate evidential input, not recovered trace content. The dog/human contrast illustrates differently organised receiving loci; it does not establish a species-wide hierarchy or an experimentally demonstrated sensory or inferential profile.

[20] Inherited discriminator: GOT-V1-2a-1a, headings 2.3, 3.6 and 8.11, transmits the TC/NTC distinction and the BD/IPL comparator-localisation discipline inherited from Part 1. GOT-V1-2a-1, headings 6.3 and 7.8, likewise blocks promotion from retained distinction to non-triviality. These supplied papers are the recoverable citation route here; the Part 1 primary manuscripts were not supplied for direct examination in this exercise. No NTC finding is made for the table, and no intervention result is reported.

[21] Series boundary: GOT-V1-2a-1, headings 6.2-6.3, supplies composition with primitive separation. The more detailed downstream treatments remain GOT-V1-2b-4a, headings 2-4, for cut, perspective, Abstraction Gap and correction; GOT-V1-2b-4b, headings 2-4, for scalar comparability and measurement; and GOT-V1-2b-4c, headings 1.2-1.4 and 2.1, for threshold/performance separation and the observation-program envelope. These are forward navigation references, not upstream definitions of Relational Form. No equivalence is asserted between Relational Reachability, ingress horizon and measured observational performance.

References

Series papers

GOT-V1-2a-1. Relative Reference Points: Reference-Indexed Realism and the Architecture of Operational Distinction. General Organisation Theory, Volume 1, Part 2. Series manuscript, Issue 1.

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