Relative Reference Points

Reference-Indexed Realism and the Architecture of Operational Distinction

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Abstract

Within the architecture developed here, information for a locus is relational distinction.

A physical difference does not establish operational information for a locus merely because it exists, persists, can be described, or can be interpreted by an external observer. It becomes informational for that locus where it is available as distinction under reference conditions that make availability, classing, registration, retention, and possible redeployment well-posed.

This is a scoped architectural definition. It does not deny thermodynamic, statistical, physical, or other legitimate informational descriptions of states, distributions, correlations, constraints, and transformations beyond the access conditions of the locus under study. It identifies the condition under which physical difference becomes informationally available within the evaluated relation.

The Relative Reference Point is the situated reference node from which distinction evaluation becomes possible. It is not a human viewpoint, subjective perspective, semantic interpretation, or arbitrary analytical convenience. It is the locus-interface-regime position from which some differences become available, some remain unavailable, some can be classed, some can be registered, some can be retained, and some can be redeployed into later branch-realisation.

The RRP Set is the operational element-set of informational architecture:

RRP makes relation evaluable.
OP makes difference available.
OA makes difference classable.
OR makes classed difference registered.
RAS makes registration retained.
RSD makes retained distinction redeployable.

The paper therefore rejects two errors. It rejects pan-informational attribution, where every physical difference is treated as already operationally informational for the locus under study. It also rejects empty constructivism, where informational status is treated as whatever an observer imposes. Information for a locus is neither intrinsic content contained inside matter nor arbitrary interpretation imposed from outside. It is reference-indexed relation under constraint.

The relation is relative, but the constraint is real.

Part 1 of the series established the discipline required for claims that depend on reference conditions, discriminator status, comparator pressure, localisation, and attribution. Part 2 begins by applying that discipline to operational information for a locus. Before knowledge can be retained, intelligence applied, or observation registered, difference must become available as distinction for some locus under some reference regime.

This paper installs that architecture.

The next paper, *From Noise Cometh Signal*, supplies the physical bridge into this architecture. It asks how interaction produces variation, how variation becomes preserved contrast, how preserved contrast becomes channel-discriminable, and how channel-discriminable contrast may enter the RRP Set as available distinction. The later papers then ask what happens when such distinction is retained, applied, registered, abstracted, scaled, and operationally bounded.

Compressed:

Physical difference does not by itself establish information for the evaluated locus.
Information for a locus is physical difference made relationally available as operational distinction.

RRP fixes the reference node.
OP supplies available contrast.
OA classes available contrast.
OR registers one classed alternative into state.
RAS retains the registered distinction.
RSD redeploys retained distinction into later branch-realisation.
RRP-indexed information is relative to the RRP, but constrained by the world.

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1. Informational architecture

1.1. Difference and informational availability

Physical difference is variation in the world.

A difference may be a difference in location, duration, energy, pressure, temperature, charge, concentration, molecular form, surface, velocity, orientation, frequency, density, boundary condition, state trajectory, or any other physically admissible variation. Physical differences do not require observers in order to exist. A gradient may exist without being detected. A molecular pattern may exist without being classed. A mark may persist without functioning as a record. A vibration may propagate without being registered. A voltage fluctuation may occur without becoming a token.

The use of difference here is deliberately minimal. It names physical distinction whose informational status for the evaluated locus has not yet been established. It does not deny that the same state, distribution, correlation, constraint, or transformation may already be informational in a thermodynamic, statistical, physical, or other legitimate sense.

The question in this paper is narrower. It asks when physically supported difference becomes information for a locus by becoming available as operational distinction under specified reference conditions. Where that access relation has not been shown, the framework withholds attribution to the locus; it does not turn the limits of that locus into limits on what may exist beyond it.

Difference therefore marks an unestablished access status within the evaluated relation, not an ontological absence of information.

Operational informational distinction is narrower.

An operational informational distinction is a physical difference made available as an alternative under a reference node. It is a difference that can count as this rather than that for a locus under conditions that specify boundary, interface, scale, horizon, discrimination regime, abstraction regime, registration status, and possible redeployment.

The same physical difference may be informational in one relation and inert in another. A wavelength may be visible to one organism and unavailable to another. A chemical gradient may be actionable to a cell and irrelevant to a stone. A voltage range may be a bit inside a circuit and an uninterpreted electrical condition outside that architecture. A written mark may be a word for a trained reader, a visual shape for a child, and surface variation for a non-reading instrument. A legal record may alter institutional branch-space while remaining inert outside the relevant procedural regime.

The physical difference is real in each case. Its informational status is relational.

This does not mean that operational information for a locus is subjective. It means that operational information for a locus is not established by physical difference alone. A difference becomes informationally available within the evaluated relation where it enters a path that makes it available as an alternative for that locus.

The reference condition does not add reality or information to the target by fiat. The difference may already be real, structured, and informational under other legitimate descriptions. What the reference condition adds is evaluability for this locus. It states the relation under which the difference can count as signal rather than noise, present rather than absent, this rather than that, retained rather than lost, deployable rather than inert, or consequential rather than merely describable.

Information for a locus becomes established where difference becomes reference-conditioned as operational distinction.[1]

1.2. The realist guardrail

Because operational information for a locus is relational, it may be mistaken for subjectivism. That mistake must be blocked from the start.

To say that operational information for a locus is RRP-relative is not to say that it is invented by a mind. It is not to say that reality waits for human interpretation. It is not to say that all frames are equal, that any state can mean anything, or that physical constraint disappears once reference conditions are acknowledged.

The claim is different.

No finite locus receives total reality. Any locus encounters only what becomes available through boundary, interface, channel, threshold, scale, discrimination regime, abstraction, registration, retention, and possible redeployment. That is a condition of finitude, not a denial of reality.

Reality constrains every stage.

A contrast either reaches an interface or it does not. A channel either preserves a difference above the relevant noise regime or it does not. An abstraction either preserves the relevant relation or collapses it. A registration event either occurs or fails. A retained state either persists over the operational horizon or degrades. A redeployment pathway either makes later branch-realisation depend on the retained distinction or it does not. A comparator either

exposes the dependence or shows that the proposed distinction was not doing the claimed work.

A thermometer does not invent thermal relation by registering temperature. It also does not possess the full thermal state of the system. It registers a bounded relation under material design, calibration, contact, scale, and readout conditions. A camera does not invent light. It also does not possess the event it records. It registers a light-mediated relation under aperture, exposure, sensor, angle, processing, and retention conditions. A receptor does not invent molecular structure. It also does not register every molecular difference. It registers only the differences its binding architecture makes available.

Operational information for a locus is therefore neither unmediated possession nor arbitrary interpretation.

It is reference-indexed relation under constraint.

The relation is relative. The constraint is real.[2]

1.3. The sequence burden

This opening position creates a sequence burden for the rest of Part 2.

First, the reference architecture must be installed. That is the burden of this paper.

Second, the physical pathway into availability must be grounded. A difference does not become available without physical support. It must be carried, preserved, transformed, stabilised, discriminated, or made accessible through some medium, channel, interface, or regime. That is the burden of the signal paper.

Third, the realism-facing consequence of the architecture must be made explicit. If every finite informational claim is RRP-indexed, then realism cannot mean unbounded possession of the real. It must mean target-constrained modelling under access conditions, scale, horizon, comparator pressure, and residual discipline. That is the burden of the reference-indexed realism paper.

Fourth, once distinction is available and the realism guardrail has been made explicit, the series can separate its major informational statuses. If distinction is retained as present accessible state, the issue is knowledge. If distinction is applied to downstream trajectory selection, the issue is intelligence. If distinction is registered through a bounded interface into retained record, the issue is observation.

Fifth, once observation is established, the sequence can ask how observation is abstraction-bound, scale-bound, and operationally bounded. That is the burden of the later observation-extension papers.

1.4. The Relational Access Principle

The architecture rests on a simple access principle:

A finite locus does not possess reality as total state. It encounters reality only through relations by which difference becomes available, classed, registered, retained, and possibly redeployed.

This principle should not be read as a denial of reality. It does not say that reality is made by the observer, that all relations are equal, or that physical difference disappears outside a reference node. Physical difference may exist independently of any locus that can register it.

Magnitude, structure, duration, energy, and constraint may be real whether or not a given system can encounter them.

The claim is narrower.

For any finite locus, encounter is relational. A locus meets the world through boundary, interface, channel, threshold, scale, discrimination regime, abstraction, registration pathway, retention condition, and possible redeployment. It never receives the whole. It receives what can become available under the conditions of its own access.

This is why RRP is necessary.

Without a reference node, the informational question is underdetermined. A difference may exist, but it has not yet been specified for what locus, through what interface, at what scale, over what horizon, under what abstraction, or with what registration and retention conditions it can count as distinction.

The Relational Access Principle therefore gives the reason for the RRP Set. RRP does not make reality relational by assertion. It names the point at which a finite locus can become answerable to reality through relation.

Compressed:

Reality is not created by the locus.
Reality is not possessed whole by the locus.
Reality is encountered through relation.
Operational information for a locus becomes available where relation makes difference operationally distinguishable.

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2. The Relative Reference Point

2.1. RRP as reference node

A Relative Reference Point is the situated reference node from which distinction evaluation becomes well-posed for a locus.

The phrase must be read technically.

Relative does not mean subjective. Reference does not mean arbitrary description. Point does not mean a mathematical location alone. An RRP is the locus-interface-regime position at which difference becomes evaluable as distinction.

A locus is the unit relative to which distinction is evaluated in the present relation. That use should remain local. It does not decide in advance where a later retained state, applied distinction, observation program, or downstream deployment must be located. A later paper may draw the relevant locus differently because the relation being evaluated has changed. What cannot be allowed is silent transfer. A distinction available to one locus should not be attributed to another merely because both participate in the same wider system, carrier, environment, institution, or chain of consequence. In this paper, RRP fixes the reference node from which informational availability becomes well-posed; later claims must still specify their own operative locus when retention, application, registration, redeployment, or comparator-stable consequence becomes the issue.

An interface is the relation through which the locus can encounter difference. It may be a membrane, receptor, sensor, channel, contact surface, input port, measuring apparatus, code pathway, institutional form, social procedure, or other boundary-mediated coupling. The interface determines which differences can become available and which remain outside the operative relation.

A regime is the structured condition under which availability, discrimination, classing, registration, retention, and redeployment become possible. It includes boundary, scale, horizon, noise tolerance, abstraction, comparator assumptions, and the relevant branch-space of the claim.

An RRP therefore does not merely state where something is. It states from where and under what conditions a distinction can matter.

A physical difference without an RRP remains underdetermined as operational information for the evaluated locus. It may be real and may stand in other informational relations, but the present informational question has not yet been posed. The RRP supplies the “for what” and “under what conditions” of distinction. For what locus is the difference available? Through what interface does it arrive? At what scale are alternatives individuated? Over what horizon must a state persist? Under what discrimination regime is variation treated as signal or noise? Through what abstraction regime can an alternative be classed? What counts as registration? What would count as retention? What would count as redeployment?

These questions are not external philosophical additions to operational informational attribution. They are the conditions under which informational attribution becomes well-posed.

2.2. The relative condition

The word relative carries the burden of the architecture.

It means that informational identity is not absolute. A state does not have the same informational identity under every possible relation. A mark, molecule, sound, voltage, record, boundary, gesture, or symbol becomes informational only under conditions that make it available as distinction.

The same carrier may support different informational relations under different RRPs. A physical inscription may function as ink pattern, letter, word, evidence, command, artwork, password, ritual sign, database entry, or non-operative surface variation. The carrier matters in every case, but the informational identity is not reducible to the carrier. It is fixed by the relation in which the carrier is produced, classed, registered, retained, and redeployed.

Relative also means that no distinction is evaluated from nowhere. There is always a locus, even where the locus is distributed, technical, institutional, or implicit in a measurement regime. There is always an interface, even where the interface is standardised, automated, or hidden behind an instrument. There is always a scale, even where the scale is inherited from convention. There is always a horizon, even where persistence is assumed. There is always a discrimination regime, even where noise is ignored. There is always an abstraction regime, even where the abstraction has become familiar enough to disappear.

The R in RRP is therefore a constraint on overclaim.

It prevents a distinction from being treated as universally available merely because it is available somewhere. It prevents a record from being treated as content in itself merely because one regime can read it. It prevents a measurement from being treated as possession

merely because a number has been produced. It prevents a category from being treated as natural merely because it is institutionally stable. It prevents a model from being treated as reality merely because it preserves selected relations with precision.

Relative does not mean weak.

A relation may be strongly constrained, repeatable, precise, corrigible, and widely exportable. A well-calibrated instrument may preserve a relation across many contexts. A formal code may stabilise token identity across machines. A biological receptor may reliably distinguish molecular classes. A scientific model may preserve invariants across interventions. A legal category may operate consistently inside a jurisdictional procedure.

The strength of these cases does not remove relativity. It shows that some relative architectures preserve real relations with high fidelity.

The opposite error is to treat relativity as arbitrariness. If operational information for a locus depends on RRP, one might think any RRP can make any difference informational. That is false. Many proposed reference nodes fail. A channel may not support the contrast. A scale may not preserve the relation. An abstraction may collapse relevant differences. A registration pathway may be absent. A retained token may degrade. A redeployment pathway may be unavailable. A comparator may show that the proposed distinction had no downstream role.

Relativity is not exemption from reality.

It is the form through which finite loci become answerable to reality.

2.3. RRP and branch-realisation

An RRP is not merely a static frame. It is a node in branch-realising structure.

At an RRP, the world is not encountered as total physical state. It is encountered as a field of possible alternatives under conditions. Some differences become available. Others do not. Some differences are classed as the same. Others remain distinct. Some alternatives register. Others remain unselected. Some registered states persist. Others vanish. Some retained states become available for later redeployment. Others remain inert or decay.

This is why informational architecture must be understood through branch-realisation.

A branch is not necessarily a conscious choice. It is an alternative trajectory, outcome, registration, transition, action, or downstream state that may or may not become realised under the operative regime. A system need not deliberate in order for branch-realisation to occur. A molecule may bind or not bind. A switch may cross threshold or remain below it. A channel may open or stay closed. A cell may repair or replicate. A program may route execution one way rather than another. An institution may classify a case under one procedure rather than another.

An RRP determines which branch alternatives are available to the locus at all.

A chemical threshold makes some concentration differences branch-relevant and others inert. A transistor gate makes some voltage ranges branch-relevant and others noise. A receptor makes some molecular structures branch-relevant and others unavailable. A measuring device makes some physical values branch-relevant by converting them into readable state. A legal procedure makes some differences branch-relevant by classifying them as admissible, inadmissible, valid, invalid, permitted, forbidden, liable, or exempt.

In each case, the RRP does not create the universe of possibilities. It fixes the reference node at which some possibilities become available as alternatives.

The world as available to a finite locus is RRP-structured.

That does not mean the world itself is reducible to the locus. It means the locus never receives the world apart from the reference node through which difference becomes available as branch.

An RRP is therefore the first unit of informational architecture.

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3. The RRP Set

3.1. Why RRP must be expanded into a set

The RRP names the reference node. By itself, that name is not enough to describe the operations through which RRP-indexed information becomes possible.

A node must have available alternatives. Those alternatives must be classed. One classed alternative must be registered. The registration must persist if it is to become retained distinction. The retained state must be redeployed if it is to shape later branch-realisation.

The RRP Set names this operational element-set.

The RRP Set consists of:

RRP — Relative Reference Point.
OP — Ontic Projection.
OA — Ontic Abstraction.
OR — Ontic Registration.
RAS — Registered Abstraction State.
RSD — Registered-State Deployment.

This sequence should not be read as a rigid temporal chain in every case. In many complex systems, the components are stabilised together, nested, repeated, distributed, inherited, or recursively coupled. A mature organism, computer, scientific instrument, institution, or language system does not build the whole sequence from zero at every moment. It inherits channels and abstraction regimes. It retains records. It redeploys earlier states. It may use one retained state as part of the reference conditions for another.

Even so, the element distinctions are necessary.

Without RRP, the informational claim has no reference node.

Without OP, there is no available contrast field.

Without OA, there is no classed alternative.

Without OR, there is no registration event.

Without RAS, there is no retained token-state.

Without RSD, there is no redeployment of retained distinction.

The RRP Set is therefore the basic architecture by which physical difference becomes operational distinction.

3.2. Ontic Projection

Ontic Projection is the available contrast field at an interface under specified reference conditions.

OP is not projection in the psychological sense. It is not an observer imagining difference into the world. It is the structured availability of alternatives to a locus through a boundary, interface, channel, scale, horizon, and discrimination regime.

A difference may exist without entering OP. A light wavelength may exist outside the range of an eye or sensor. A molecular difference may exist outside the binding relation of a receptor. A pressure variation may be below a threshold. A voltage fluctuation may fall inside a noise band. A social relation may exist without being captured by a record form. A harm may occur without entering a legal category. A pattern may be real but unavailable to a model because no variable preserves it.

OP names the field of differences that are available enough to become candidates for classing and registration.

It is therefore more specific than possibility. Many things are possible in the abstract. OP concerns what is available to this locus, through this interface, under these conditions. It is also more specific than actual occurrence. OP includes alternatives that could have been registered under the regime, not only the one that was selected.

For a transistor gate, OP is the available electrical contrast under circuit conditions. For a receptor, OP is the available molecular contrast under binding and environmental conditions. For a detector, OP is the signal field available through channel and threshold. For a cell, OP may include gradients, damage states, energy conditions, membrane states, or molecular signatures. For a measuring instrument, OP is the physical variation that the instrument can convert into readable alternatives. For a computer, OP may include addressable states, input tokens, memory locations, or executable alternatives. For an institution, OP may include cases, records, statuses, claims, acts, or persons made available to its procedure.

OP is branch-availability.

It supplies the field from which one alternative may later be classed and registered. Without OP, there may be physical evolution, but no well-posed informational alternative for the locus under evaluation.

This is why OP must remain relational. It is not a universal inventory of all possible differences. It is the contrast field available at an RRP.

3.3. Ontic Abstraction

Ontic Abstraction is the operative classing regime by which OP-supported differences become registerable alternatives.

OA determines which differences count as the same, which count as different, which are relevant, which are irrelevant, which are signal, which are noise, which are within tolerance, and which are outside tolerance at the reference scale.

This makes OA central to the entire architecture.

A finite system cannot register total physical detail. If it attempted to preserve every microdifference without classing, it would not produce an informational token. It would have no stable same/different relation, no threshold, no category, no signal/noise distinction, no

retained alternative, and no basis for redeployment. RRP-indexed information requires abstraction because registerable distinction requires classing.

This is not a defect. It is the condition of informational availability.

A transistor abstracts continuous voltage variation into operational classes. A receptor abstracts molecular variation into functional binding or activation classes. A sensory organ abstracts environmental variation into usable channels. A measuring instrument abstracts physical variation into calibrated values. A memory cell abstracts substrate variation into token states. A word abstracts many encounters into a linguistic class. A map abstracts terrain into route relation. A legal system abstracts behaviour into procedural categories. A model abstracts variables from a larger relational field.

OA is therefore not late, mental, or optional. It is operative wherever difference becomes registerable.

The abstraction regime may be materially embodied, as in a molecular receptor or transistor. It may be technically stabilised, as in an instrument or machine protocol. It may be formally specified, as in mathematics or code. It may be socially inherited, as in language, law, ritual, or institutional classification. It may be biologically evolved, as in sensory systems, immune recognition, metabolic regulation, and neural weighting.

In every case, abstraction does two things at once.

It excludes. It compresses. It ignores detail. It collapses variation. It treats some differences as irrelevant.

It also reveals. It stabilises recurrence. It makes comparison possible. It allows a difference to become this rather than that. It allows registration to occur. It allows retention to preserve something identifiable. It allows later redeployment to consult the retained distinction.

OA is branch-classing.

It does not select the branch. That is OR. It determines the class of alternatives among which selection can be informationally meaningful.

This distinction prevents a common error. A later observer may describe any physical transition as if it selected among alternatives. But unless there is an operative classing regime under which alternatives count as alternatives for the locus, the transition remains physical evolution rather than informational registration.

OA makes OP registerable.[3]

3.4. Ontic Registration

Ontic Registration is the event by which one OP-supported, OA-classed alternative becomes selected into state.

OR is not any interaction. Physical systems constantly affect one another. Contact, perturbation, force, exchange, deformation, heating, cooling, binding, collision, flow, and transition may all occur without producing informational registration in the relevant sense.

OR requires that one alternative from an available contrast field becomes selected into a locus-relevant state under an abstraction regime.

A receptor registers when a classed molecular relation produces a state change that belongs to the system’s operative alternatives. A transistor registers when a voltage class is selected into circuit state. A detector registers when a channel-supported contrast produces a readable

alternative. A memory cell registers when an input is written into a stable token. A measuring instrument registers when physical variation is converted into a calibrated record. A cell registers damage when molecular or structural conditions enter a regulatory pathway. An institution registers a case when submitted material is accepted into a procedural category.

The registration event matters because registration cannot be reduced to available difference alone. OP may supply alternatives. OA may class alternatives. But until an alternative is selected into state, no registration has occurred.

OR is branch-selection into state.

It is the transition by which one classed possibility becomes actual for the locus. The state produced by OR may be transient. It may persist. It may be retained. It may be redeployed. Those are further questions. OR itself names the event of registration, not the whole later chain.

This distinction is necessary because many claims collapse distinct informational statuses into a single category. A contrast may be available but never registered. A perturbation may occur but not be classed. A transient state may occur but not persist. A persistent state may exist but not be redeployed. Each status must be kept separate.

OR is also relational to OP and OA. It cannot select an informational alternative from nowhere. It selects from the contrast field available at the interface, under the classing regime that makes the alternative identifiable.

Without OP, OR collapses into undifferentiated transition.

Without OA, OR lacks token identity.

Without RRP, OR lacks reference conditions.

Ontic Registration is therefore not merely state change. It is state change as classed selection under a reference node.

3.5. Registered Abstraction State

A Registered Abstraction State is the retained token-state produced by Ontic Registration.

RAS is the first stable form in which a registered distinction becomes present accessible state. It may be a molecular state, conformational change, stored charge, written mark, retained memory state, database entry, instrument record, learned weighting, symbolic token, institutional record, or other retained carrier.

But a RAS is not content in itself.

Its identity depends on the process that fixed it.

The same physical state may be noise under one RRP, a record under another, and a different record under a third. A scratch on a surface may be accidental damage, tally mark, evidence of contact, symbolic inscription, manufacturing defect, ritual sign, or irrelevant surface variation. A stored voltage may be unreadable charge, binary value, corrupted memory, encrypted token, or control state depending on architecture. A molecular sequence may be inert chemistry, retained biological relation, laboratory record, forensic evidence, or computational string depending on the RRP under which it is classed, registered, retained, and redeployed.

A RAS therefore carries informational identity as retained relation.

It is relational to the OP contrast field from which alternatives were available. It is relational to the OA regime that classed those alternatives. It is relational to the OR event that selected one alternative into state. It is relational to the RRP under which the token remains identifiable. It is relational to the operational horizon over which persistence is evaluated.

The informational identity of a RAS is not intrinsic content stored inside a carrier. It is a retained relation fixed into present accessible state by its classing and registration history.

A RAS is retained abstraction. It preserves not total reality, but a classed distinction. The carrier may be material, biological, computational, symbolic, institutional, or distributed. The carrier matters because no RAS exists without physical support. But the informational identity of the RAS is not reducible to carrier microdetail alone. It depends on the classed registration pathway that produced it.

RAS is branch-retention.

A prior branch has become retained as present accessible state. The past alternative is no longer merely past. It persists in a form that may be identifiable, consultable, transmissible, or redeployable under further conditions.

This is why RAS will later become the canonical carrier of knowledge. But the present paper does not yet define knowledge. It defines the architecture that makes retained distinction possible.

3.6. Registered-State Deployment

Registered-State Deployment is the redeployment of a retained Registered Abstraction State into later registration, transition, control, or branch-realisation.

RSD is not mere storage. A retained state may exist without being consulted. A record may persist in an archive without affecting later outcomes. A retained memory state may be present without being activated. A rule may exist without being applied. A model may be stored without constraining a later calculation. A sign may be visible without being read by a locus that can use it.

RSD occurs when retained distinction becomes operative again.

A stored token may be read. A memory may guide action. A molecular state may alter pathway response. A trained parameter may condition later processing. A calibration record may correct a later measurement. A legal record may alter institutional classification. A written instruction may change downstream behaviour. In each case, the retained state is not merely present; it is redeployed.

RSD is branch-redeployment.

It is the hinge between retained distinction and later consequence. Once a retained state is redeployed, it may shape the OP field available to another RRP, constrain an OA regime, trigger a further OR event, produce another RAS, or alter downstream branch-space.

This is how informational complexity begins to build without adding new primitives.

A retained distinction can become a condition of later distinction. A registered state can become part of the regime through which further alternatives become available, classed, registered, retained, or redeployed.

However, RSD must not be inflated. A retained state is not redeployed merely because it exists. Redeployment requires operational use in later registration, transition, control, or branch-realisation. Where that use is absent, the state remains retained but not deployed.

RSD therefore preserves the distinction between storage and consequence.

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4. Abstraction, fixing, and informational identity

4.1. RRP-indexed information is abstraction-bound

RRP-indexed information is abstraction-bound because no finite locus registers total physical detail.

A physical situation contains more difference than any locus can make operative. A locus encounters difference through an abstraction regime that makes some differences available as alternatives while treating others as equivalent, irrelevant, below threshold, saturated, or outside the frame.

Abstraction is not a defect added after the fact. It is the condition under which informational identity becomes possible.

If a system could not abstract, it could not register. It would face unpartitioned variation without stable same/different relation, without threshold, without signal/noise distinction, without token identity, without retained alternative, and without basis for later redeployment.

The question is therefore not whether abstraction is present. The question is whether the abstraction preserves the relation it is being used to carry under the relevant RRP.

A bad abstraction collapses differences that matter or preserves differences that do not. A good abstraction preserves the relevant relation while reducing irrelevant complexity. A powerful abstraction remains valid across contexts because it tracks a stable relation beneath superficial variation. A dangerous abstraction remains compelling while losing contact with the relation it was meant to carry.

The present paper does not yet develop the full theory of perspective, objectivity, scale, or abstraction gap. Those belong to later observation-extension papers. Here the point is narrower and foundational: RRP-indexed information requires abstraction because operational distinction requires classing.

OA makes OP registerable.

OR selects one OA-classed alternative into state.

RAS retains that classed registration.

RSD redeploys retained distinction where later branch-realisation depends on it.

At every stage, the informational relation is abstraction-bound.

4.2. Informational identity is fixed by its making

A retained token does not acquire a determinate RRP-indexed informational identity merely by occupying a physical state. That identity depends on its production through a specific registration pathway from an available contrast field under an abstraction regime.

This is the fixing condition of informational identity.

A carrier may persist. A mark may remain on a surface. A molecule may retain a sequence. A voltage state may remain stable. A database entry may remain stored. A neural weighting may remain altered. An institutional record may remain archived. But persistence alone does not determine what informational identity is attributable to the carrier. The informational identity of the carrier depends on the relation through which it was made, classed, registered, retained, and made available for possible redeployment.

A scratch on a surface may be accidental damage under one RRP, a tally under another, evidence under another, manufacturing defect under another, symbolic inscription under another, or irrelevant surface variation under another. The material scratch does not change merely because the RRP changes. What changes is the informational relation in which the scratch is available, classed, registered, retained, or redeployed.

A stored voltage may be unreadable charge in one context, a binary value in another, corrupted memory in another, encrypted token in another, control state in another, or noise in another. The physical support matters in every case, but the informational identity is not fixed by carrier microdetail alone.

A molecular sequence may be inert polymer, retained biological relation, laboratory record, forensic evidence, encoded string, or potential input to a host-completion pathway depending on the RRP under which it is made available and the regime in which it can be classed, registered, retained, or redeployed.

The same inscription may be ink distribution, letter sequence, legal instruction, poetic line, password, database field, ritual mark, or non-operative surface variation. The carrier is physically continuous across those cases. The informational relation is not.

This is why informational identity must be fixed by its making.

The relevant question is not only what physical state exists. The relevant question is how that state became a token under the RRP Set. What OP contrast field made alternatives available? What OA regime made those alternatives classable? What OR event selected one classed alternative into state? What conditions allowed the state to persist as RAS? What later pathway could redeploy the retained distinction as RSD?

Without those questions, the carrier is over-read. It is treated as though it contains its informational identity intrinsically. That error collapses an RRP-indexed informational relation into material inscription.

The opposite error is to detach operational information for a locus from its carrier entirely. That turns the informational relation into immaterial content, semantic projection, or free-floating form. The framework rejects that error as well. No RAS exists without physical support. No registration occurs without a state transition. No retained token persists without substrate, stability, horizon, and regime conditions. No redeployment occurs without a pathway through which retained distinction becomes operative again.

Informational identity is therefore neither substrate alone nor interpretation alone.

It is fixed relation.

The carrier supplies physical support. The RRP Set supplies informational identity. The world constrains both.[4]

4.3. Carrier is necessary but not sufficient

No operational information in this architecture exists without physical support.[5]

A distinction claimed as operational information for a locus must be embodied in some material, energetic, organisational, biological, computational, symbolic, institutional, or distributed carrier. It must be supported by states that can differ, persist, be discriminated, be classed, or be redeployed under the relevant conditions. A distinction without physical support cannot be operational information in this framework. It is an abstraction without an implementation.

But physical support alone is not sufficient.

A stone has structure. A molecule has conformation. A surface has texture. A weather pattern has dynamics. A star has gradients. A river has flow. A magnetic field has orientation. These conditions may be physically real, persistent, and richly describable. They may also become informational for some locus under some RRP. But they are not information for every locus merely because they differ.

The same rule applies to artificial, symbolic, and institutional carriers. A book is not knowledge for a system that cannot register its marks. A database is not information for a process with no access pathway, schema, query relation, or relevant use. A measurement is not informational for a locus if the scale is unavailable, the calibration regime is absent, or the output cannot be classed. A law is not operative information outside the institutional regime in which acts, persons, evidence, jurisdiction, and procedure are classable. A model is not a record of reality by existing; it preserves selected relations only under its variables, transformations, assumptions, and validation conditions.

The carrier is necessary because no distinction floats above the world.

The carrier is insufficient because no carrier bears the same informational identity under every relation.

This gives the basic formula:

Information for a locus is not matter alone.

Information for a locus is not meaning alone.

Information for a locus is physical difference made relationally available as operational distinction.

The framework therefore rejects two symmetrical reductions.

The first reduction treats information for a locus as intrinsic content stored inside matter. On that view, a sequence, mark, state, or pattern contains information simply by being arranged. The RRP correction shows that this is incomplete. A carrier may support many possible informational relations, or none for the locus under evaluation. The carrier does not determine the relation by itself.

The second reduction treats information for a locus as whatever an observer interprets. On that view, content is imposed by description. The RRP correction shows that this is also incomplete. An interpretation may fail because the channel does not preserve contrast, the scale is wrong, the abstraction collapses the relation, the registration pathway is absent, the retained token degrades, or redeployment does not occur.

The carrier matters. The relation matters. The constraint matters.

Within this architecture, information for a locus is physical, relational, and operational at once.

4.4. Abstraction does not license arbitrariness

Because RRP-indexed information is abstraction-bound, it may appear that any abstraction can make any difference informational. That conclusion does not follow.

Abstraction is a necessary condition of RRP-indexed information, but not every abstraction succeeds.

An abstraction succeeds only where it preserves the relation it is being used to carry strongly enough for the claim being made. A receptor abstraction succeeds if it preserves the molecular distinction relevant to downstream state change. A measurement abstraction succeeds if it preserves the magnitude relation within tolerance. A legal abstraction succeeds if it preserves the procedural distinction required for classification, responsibility, remedy, or exclusion. A model abstraction succeeds if its selected variables preserve the target relation across the conditions under which the model is used.

An abstraction fails when it collapses differences that matter, preserves differences that do not, misweights the relation, shifts scale without control, treats noise as signal, treats signal as noise, or carries a local relation beyond the horizon within which it remains stable.

These failures do not make RRP-indexed information subjective. They make informational claims corrigible.

A failed abstraction is not evidence that reality has no structure. It is evidence that the RRP Set has been badly specified, weakly supported, or overextended. The contrast field may have been misidentified. The classing regime may have been inappropriate. The registration event may not have selected the claimed alternative. The retained state may not preserve the relevant distinction. The redeployment pathway may not make downstream branch-realisation depend on the retained distinction.

In this paper, abstraction is treated only at the architectural level. Later observation papers will develop cut, perspective, scale, Abstraction Gap, relational uncertainty, and objectivity. Those later terms should not be imported backward as if they were needed to define RRP. The present claim is narrower:

Operational information for a locus requires abstraction because operational distinction requires classing.

That is enough for Paper 1.

5. Physical support and the handoff to Signal

5.1. Availability has a physical burden

The RRP Set establishes the reference architecture of operational information for a locus. It does not by itself describe every physical pathway by which a difference survives, travels, transforms, stabilises, or becomes discriminable enough to enter that architecture.

Availability is not free.

For a difference to become available as distinction, some physical process must preserve contrast across an interval, boundary, medium, channel, or state transition. A difference must not simply vanish into undifferentiated relaxation. It must remain distinguishable enough, at the relevant scale and over the relevant horizon, to enter a possible discrimination regime.

A contrast may fail before OP. It may dissipate immediately. It may be too weak to cross the interface. It may be masked by noise. It may fall below threshold. It may saturate the channel. It may be destroyed in transmission. It may be transformed into a state that no relevant locus can class. It may persist physically while remaining inaccessible to the system under evaluation.

A contrast may enter OP but fail before OA. It may be available in some loose physical sense while lacking a stable classing regime. The locus may be exposed to variation without being able to distinguish same from different, relevant from irrelevant, signal from noise, within tolerance from outside tolerance.

A contrast may be classed by OA but fail before OR. Alternatives may be well-defined, but no registration event selects one into locus-relevant state.

A registration may occur but fail before RAS. A transient state change may happen without persisting over the operational horizon as re-identifiable retained distinction.

A RAS may exist but fail before RSD. A record may persist without being consulted, used, transmitted, or made operative in later branch-realisation.

A redeployment may occur but fail to establish stronger downstream dependence. The retained state may be consulted without making a comparator-stable difference to later outcome classes.

These distinctions matter because they prevent information-language from sliding across the stack.

A persistent physical alteration is not automatically OP.

OP is not automatically OR.

OR is not automatically RAS.

RAS is not automatically RSD.

RSD is not automatically Non-Trivial Computation.

The architecture therefore requires a physical pathway underneath it. The RRP Set states when difference is informational for a locus. It does not make the difference physically available by assertion.

5.2. Why Signal comes next

The next paper is required because RRP alone does not yet explain signal.

RRP gives the reference condition of operational information for a locus. Signal gives the physical pathway of possible availability.

A signal is not yet knowledge, intelligence, observation, meaning, semantic content, retained record, or Non-Trivial Computation. It is physical variation preserved as contrast through a medium under conditions in which discrimination may become possible.

Signal sits between raw physical variation and RRP-indexed information.

If the series moved directly from RRP to knowledge, it would risk making retained distinction seem too abstract. If it moved directly from RRP to intelligence, it would risk making applied distinction appear without a physical route into availability. If it moved directly from RRP to observation, it would risk treating registration as though contrast simply arrives already available for classing.

The signal paper closes that gap.

It asks how physical interaction produces variation. It asks how variation becomes preserved contrast. It asks how contrast is carried, attenuated, amplified, transformed, or lost through media. It asks how channel-relative discriminability emerges under noise, alphabet, coding, and receiver conditions. It asks how such discriminable contrast may become available as OP for a locus under RRP-indexed conditions.

The distinction between RRP and signal is therefore simple:

RRP asks: for what locus, through what interface, and under what regime does a difference become operationally informational for that locus?

Signal asks: by what physical pathway can contrast become available to such a locus at all?

Both are required.

Without RRP, signal becomes over-read as RRP-indexed information for a locus wherever contrast can be described. Without signal, RRP risks appearing as an abstract reference scheme detached from the physical cost, medium, channel, threshold, and noise conditions through which availability is actually achieved.

Paper 1 therefore hands off to Signal before the series turns to knowledge, intelligence, and observation.

5.3. Signal is prepared, not defined

This paper prepares the signal problem but does not solve it.

It has already shown that operational information for a locus requires availability and reference conditions that make classing, registration, retention, and possible redeployment well-posed. But it has not yet shown how a physical difference becomes available contrast. That task requires attention to interaction, dissipation, medium, carrier, channel, noise, discrimination, stability, and loss.

A pressure wave may carry contrast. A photon flux may carry contrast. A chemical gradient may carry contrast. A voltage range may carry contrast. A surface mark may carry contrast. A molecular conformation may carry contrast. A written inscription may carry contrast. A biological pathway may carry contrast. An institutional record path may carry contrast.

In each case, the question is not merely whether variation exists. The question is whether contrast is preserved sufficiently to become available for a locus under reference conditions.

That is the entrance to Signal.

Paper 1 stops before that entrance and fixes the architecture into which signal-bearing contrast may later enter.

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6. Compounding without new primitives

6.1. RAS may become a later condition

Once a registered distinction is retained, it can become part of the reference conditions for later distinction.

A RAS may alter what becomes available as OP. It may constrain a later OA regime. It may trigger a further OR event. It may be retained again in a new RAS. It may be redeployed through RSD. It may shape branch-space for a later locus.

This is the first point at which informational architecture becomes recursive.

A cell may retain a molecular state that changes later sensitivity to a gradient. A nervous system may retain a weighting that changes later perception or action. A measuring instrument may retain calibration that changes later registration. A database may retain an entry that changes later retrieval, classification, or decision. An institution may retain a precedent that changes later procedural classification. A model may retain parameters that alter later outputs. A language may retain categories that shape later salience, description, and inference.

In each case, the retained distinction does not remain isolated. It becomes part of a later regime through which new differences become available, classed, registered, retained, or redeployed.

This does not mean that every RAS automatically becomes a new RRP.

A retained state becomes RRP-relevant only where it participates in later distinction evaluation. A stored token that is never accessed, never consulted, never used as a condition, and never made operative in later branch-realisation remains retained but not redeployed. It may be a record-present state, but it is not yet a later reference node merely because it persists.

Compounding requires later availability, later classing, later registration, later retention, or later redeployment.

6.2. Recursive informational architecture

Informational complexity begins when retained distinction becomes available for later distinction.

The same element-set remains in force. RRP fixes the reference node. OP supplies available contrast. OA classes the contrast. OR registers one classed alternative. RAS retains the registration. RSD redeploys retained distinction.

Recursion does not add a new primitive. It repeats, nests, distributes, or couples the same architecture.

This is why the RRP Set can scale across biological, technical, cognitive, social, institutional, and artificial systems. A molecular pathway, a nervous system, a scientific instrument, a computer, a legal institution, and a language community may differ radically in substrate and complexity. But each informational claim still requires a reference node, available contrast, classing, registration, retention where record-status is claimed, and redeployment where downstream operativity is claimed.

A mature system may stabilise many RRPs at once. It may inherit prior RAS tokens. It may redeploy some retained states to alter later OP fields. It may use one abstraction regime to class the outputs of another. It may retain records that later become inputs to further records. It may distribute registration across many loci. It may support long chains of redeployment. It may externalise RAS into artefacts, archives, signs, instruments, databases, or institutions.

None of this requires replacing the architecture.

The complexity lies in composition, not in new primitives.

This point matters for the rest of Part 2. Knowledge, intelligence, and observation are not separate metaphysical domains. They are facet translations of the same architecture under different explanatory emphases.

Knowledge emphasises retained distinction.

Intelligence emphasises applied distinction.

Observation emphasises bounded registration and record provenance.

Signal emphasises preserved contrast and physical availability.

The later observation-extension papers emphasise abstraction, scale, and operational envelope.

All inherit the RRP Set.

6.3. The limit of compounding

Compounding must also be guarded against inflation.

It is tempting to treat every later consequence of a retained state as informational recursion. That is too broad. A physical state may influence later dynamics without being redeployed as retained distinction. A mark may erode a path, a gradient may alter flow, a structure may constrain motion, or a residue may change reaction probability without functioning as RAS under a classing and registration history for the locus being evaluated.

The framework does not deny these effects. It refuses to overname them.

Where a retained state affects later physical evolution but is not available as a retained distinction under a relevant RRP, the correct description may remain physical alteration, constraint, residue, or background condition. Where it becomes available as a classed retained state for later distinction evaluation, RAS and RSD may become appropriate. Where downstream trajectory selection depends comparator-stably on the distinction, stronger claims become available.

The difference is not rhetorical. It is diagnostic.

Compounding must preserve the discriminator conditions of the stack. Otherwise RRP architecture collapses back into pan-informational description.

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7. Guardrails and failure modes

7.1. RRP is not subjectivity

Failure mode: treating RRP-indexed information as mind-dependent construction.

Error: because operational information for a locus is relative to a reference node, it is assumed to be invented by a conscious observer, private perspective, semantic act, or interpretive decision.

Correction: RRP-relative means reference-indexed. The locus may be non-conscious, non-human, biological, technical, institutional, computational, or distributed. Reality constrains which differences become available, which abstractions preserve relations, which registrations occur, which retained states persist, and which redeployments alter branch-realisation.

RRP blocks subjectivism as much as it blocks naïve informational realism.

7.2. RRP is not the whole mechanism

Failure mode: using RRP as shorthand for the entire operational stack.

Error: RRP is made to do the work of OP, OA, OR, RAS, or RSD. The result is conceptual compression that hides which operation is actually being claimed.

Correction: use RRP for the reference node. Use OP for available contrast. Use OA for classing. Use OR for registration. Use RAS for retained token-state. Use RSD for redeployment.

When precision matters, the component doing the work must be named.

7.3. OP is not every possible difference

Failure mode: treating all physical variation as available contrast.

Error: because a difference exists or can be described by an external analyst, it is treated as OP for the locus.

Correction: OP is the contrast field available at an interface under specified reference conditions. A difference may exist while remaining outside the channel, below threshold, above saturation, masked by noise, unavailable at the scale, too degraded over the horizon, or inert for the locus.

No RRP-indexed availability, no OP.

7.4. OA is not arbitrary interpretation

Failure mode: treating abstraction as external meaning imposed after the fact.

Error: OA is confused with subjective interpretation, semantic reading, or analyst classification detached from the operative regime.

Correction: OA is the operative classing regime by which OP-supported differences become registerable alternatives. It may be materially embodied, biologically evolved, technically stabilised, formally specified, socially inherited, or institutionally enforced. It is constrained by whether the classing preserves the relation under the reference conditions.

No operative classing, no OA.

7.5. OR is not any state change

Failure mode: treating perturbation, coupling, or lawful transition as registration.

Error: any physical interaction is described as if it selected an informational alternative.

Correction: OR requires one OP-supported, OA-classed alternative to become selected into locus-relevant state. A state change without available contrast and classed alternatives may be physically real, but it is not OR in the technical sense.

No OP and OA, no OR.

7.6. RAS is not carrier content

Failure mode: treating a retained carrier as if it contains a determinate informational identity intrinsically.

Error: a mark, molecule, sequence, voltage, retained memory state, database entry, or record is treated as content in itself.

Correction: RAS is retained relation. It is a token-state whose informational identity depends on the OP field, OA regime, OR event, RRP conditions, and persistence horizon that fixed it.

No retained relation, no RAS.

7.7. RSD is not storage

Failure mode: treating retained state as redeployed merely because it persists.

Error: a record is assumed to be operative because it exists, is stored, or could be interpreted by an external observer.

Correction: RSD requires the retained distinction to become operative in later registration, transition, control, or branch-realisation. A RAS may persist without being redeployed.

No later operativity, no RSD.

7.8. RRP-indexed information is not yet Non-Trivial Computation

Failure mode: treating available, registered, or retained distinction as already Non-Trivial Computation.

Error: once a distinction is available, stored, or redeployed, it is assumed that downstream trajectory selection depends on it in the strong comparator-stable sense.

Correction: Non-Trivial Computation requires organisation-dependent, counterfactually testable downstream outcome dependence on discriminable distinctions under specified reference conditions and comparator discipline. RRP-indexed information prepares that possibility, but it does not by itself establish it.

No comparator-stable downstream dependence, no NTC.

7.9. RRP Set is not a licence for concept multiplication

Failure mode: treating every derived case as requiring a new primitive.

Error: signal, knowledge, intelligence, observation, abstraction, scale, measurement, and operational envelope are treated as separate foundations rather than facet translations or descriptor layers built from the inherited architecture.

Correction: the RRP Set remains the architecture. Later papers add burdens, facets, and descriptors. They do not replace the element-set unless a new discriminator is explicitly introduced and justified.

Install once. Inherit thereafter.

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8. Sequence handoff

8.1. What Paper 1 has installed

This paper has installed the reference architecture of operational informational distinction.

Physical difference does not by itself establish information for the evaluated locus. A difference becomes informational for that locus where it is available as distinction under reference conditions that make availability, classing, registration, retention, and possible redeployment well-posed.

The Relative Reference Point is the situated reference node of informational availability. It fixes the locus-interface-regime position from which distinction evaluation becomes possible.

The RRP Set names the operational architecture through which physical difference becomes informational distinction for a locus:

RRP makes relation evaluable.

OP makes difference available.

OA makes difference classable.

OR makes classed difference registered.

RAS makes registration retained.

RSD makes retained distinction redeployable.

The paper has also fixed the governing realist position. Information for a locus is not intrinsic content contained inside matter. It is not arbitrary interpretation imposed from outside. It is reference-indexed relation under constraint.

The relation is relative, but the constraint is real.

8.2. What remains unresolved

This paper has not yet explained the full physical pathway by which contrast becomes available. It has not yet defined signal. It has not yet defined knowledge, intelligence, or observation. It has not yet developed the later abstraction, scale, measurement, objectivity, or operational-envelope consequences.

Those are later burdens.

The paper has intentionally stopped before them.

It has not treated all physical variation as RRP-indexed information for a locus. It has not treated all signal as RRP-indexed information for a locus. It has not treated all retained state as knowledge in the stronger sense. It has not treated all downstream usefulness as intelligence. It has not treated all coupling as observation. It has not treated all abstraction as objectivity. It has not treated all scale selection as measurement. It has not treated all operational success as non-trivial dependence.

Instead, it has installed the architecture required to make those later distinctions without collapse.

8.3. Handoff to Signal

The next paper, *From Noise Cometh Signal*, supplies the physical bridge into RRP.

It asks how interaction produces variation, how variation becomes preserved contrast, how contrast moves through media, how it is attenuated, amplified, transformed, or lost, how it becomes channel-discriminable under noise and receiver conditions, and how such contrast may enter the RRP Set as available distinction.

The handoff can be stated simply:

RRP gives the reference condition of operational information for a locus.

Signal gives the physical pathway of possible availability.

Without signal discipline, RRP may appear too abstract. Without RRP discipline, signal may be over-read as RRP-indexed information for a locus wherever contrast can be described. The two papers therefore form the opening pair of Part 2.

Paper 1 defines when difference can count as information for a locus.

Paper 1a asks how physical contrast can reach that condition.

8.4. Handoff to the later facets

After Signal, the series turns to the major informational facets.

Knowledge asks what status retained distinction has once an OR-produced, OA-keyed RAS persists as present accessible state.

Intelligence asks what happens when distinction-conditioned organisation is applied to alter downstream trajectory selection for a locus.

Observation asks what happens when OP-supported difference is registered through OR into OA-keyed RAS, and in stronger cases redeployed through RSD as a controlling discriminator for later registration or downstream transition.

These papers do not replace the RRP Set. They inherit it.

Their differences are differences of explanatory emphasis and status burden.

Knowledge emphasises retention.

Intelligence emphasises application.

Observation emphasises bounded registration and record provenance.

Signal emphasises physical availability.

The later observation-extension papers then ask how observation is abstraction-bound, scale-bound, measurable, corrigible, and operationally limited.

8.5. Final compression

The controlled position from which Part 2 proceeds is this:

Physical difference does not by itself establish information for the evaluated locus.

Information for a locus is physical difference made relationally available as operational distinction.

RRP fixes the reference node.

OP supplies available contrast.

OA classes available contrast.

OR registers one classed alternative into state.

RAS retains the registered distinction.

RSD redeploys retained distinction into later branch-realisation.

RRP-indexed information is relative to the RRP, but constrained by the world.

RRP-indexed availability fixes what may be attributed to the locus; it does not exhaust what may exist beyond the relation.

The RRP Set is the architecture through which physical difference becomes operational distinction.

Endnotes

[1] Historical provenance: Gregory Bateson, "Form, Substance and Difference," *General Semantics Bulletin* 37 (1970): 5-13. Bateson's account of information through consequential difference is acknowledged as a partial precursor. The present architecture separates availability, classing, registration, retention, and redeployment rather than using consequence as the sole information threshold.

[2] Comparator: Carlo Rovelli, "Relative Information at the Foundation of Physics," in *It from Bit or Bit from It? On Physics and Information*, ed. Anthony Aguirre, Brendan Foster, and Zeeya Merali (Springer, 2015), 79-86. Rovelli treats information as relative between physical systems without thereby invoking subjectivism or idealism. RRP adds locus-interface-regime availability and the OP/OA/OR/RAS/RSD status distinctions; no technical inheritance is claimed.

[3] Formal/structural comparator: Jon Barwise and Jerry Seligman, *Information Flow: The Logic of Distributed Systems*, Cambridge Tracts in Theoretical Computer Science 44 (Cambridge University Press, 1997). Their classifications, tokens, states, and channels provide a neighbouring formal architecture. The present OA relation remains physically indexed to an RRP and does not inherit channel theory.

[4] Comparator: Fred I. Dretske, *Knowledge and the Flow of Information* (MIT Press, 1981). Dretske develops objective information through dependency, coding, and subsequent cognitive use. The present architecture stops at the more primitive finite-locus conditions under which difference becomes available, classed, registered, retained, and redeployable; no cognitive or semantic condition is inherited.

[5] Physical provenance: Rolf Landauer, "Information Is Physical," *Physics Today* 44, no. 5 (1991): 23-29, doi:10.1063/1.881299. Physical embodiment is necessary in the present architecture but not sufficient: a carrier becomes operational information for a locus only under the RRP-indexed relation.

References

Barwise, Jon, and Jerry Seligman. *Information Flow: The Logic of Distributed Systems*. Cambridge Tracts in Theoretical Computer Science 44. Cambridge: Cambridge University Press, 1997.

Bateson, Gregory. "Form, Substance and Difference." *General Semantics Bulletin* 37 (1970): 5-13.

Dretske, Fred I. *Knowledge and the Flow of Information*. Cambridge, MA: MIT Press, 1981.

Landauer, Rolf. "Information Is Physical." *Physics Today* 44, no. 5 (1991): 23-29. doi:10.1063/1.881299.

Rovelli, Carlo. "Relative Information at the Foundation of Physics." In *It from Bit or Bit from It? On Physics and Information*, edited by Anthony Aguirre, Brendan Foster, and Zeeya Merali, 79-86. Cham: Springer, 2015.