

From Bodily Causal Feeling to Whitehead's Universal Prehension: Testing the Scope Inference

Positive causal explanation without prehension as a premise, phenomenal powers, and a transport test for Matthew David Segall's universal scope claim

Nathan Sweet | Independent Researcher

Scholarly white paper | Public manuscript 1.0 | September 2026

Research status. Living public manuscript 1.0. Corrections, omitted literature, source challenges, stronger rival reconstructions, and good-faith collaboration are invited; future revisions should record what changed and why rather than treating this version as final.

Conclusion stated first.

The inquiry answered here is the one left open by the preceding debate: can causal actuality be specified positively, at substantial targets, without quietly reconstructing subjective prehension as an explanatory premise? **Yes.** Published mechanism, powers, process, organizational, and intervention-sensitive accounts provide positive causal explanations for the specified targets examined in sections 3-4 without requiring subjective prehension. Given those positive comparators, continued agnosticism about this narrower necessity question would understate what the comparison establishes. **On that question, intellectual honesty requires the affirmative answer; the remaining uncertainty concerns the universal truth of X, not whether these specified causal explanations require X as a premise.**

D is the reconstructed process-relational, causal, organizational, and independently evidenced experiential overlap retained across the comparison. **X** is the further universal claim that concrete causal actuality throughout nature is constituted by Whiteheadian prehensive occasions, so that causal efficacy everywhere is felt inheritance. **?X** combines provisional rejection of adopting X as a warranted universal ontology on the case examined with suspended judgment about whether X is true. This does not assert $\neg X$.

The reason for that asymmetric judgment is straightforward. The positive rivals actually perform the specified causal explanatory work without X in their premises. The strongest local phenomenal-power case remains contested, and the arguments examined do not supply a discriminating bridge from local phenomenal credit to fundamental, universally prehensive actuality. Universal X is therefore not warranted for adoption by this comparison; its truth remains unresolved.

Abstract

This paper tests whether causal production can be specified positively without subjective prehension as a premise and whether a distinctively experiential completion earns comparative explanatory credit. For the specified causal targets, the answer to the first

question is affirmative. Mechanistic accounts, modal powers, biological constraints, intervention tests, and direct processual rivals developed by Dupré and Esser provide substantive positive comparators while leaving an exhaustive intrinsic metaphysics unresolved.

Whitehead's scheme proposes continuity between causation and experience; Mørch develops a contested local phenomenal-powers case concerning aversive motivation; Goff, Gozzano, and Zietsch supply serious alternatives. The transport test asks which feature earns source-domain credit, whether that feature survives abstraction, and what warrants and distinguishes it in the target. The comparison supports positive causal explanation without X at the specified targets, but does not establish universal prehensive actuality. X is not adopted on this comparison; its truth remains unresolved.

Keywords: causation; causal powers; dispositions; mechanisms; process philosophy; prehension; Whitehead; panexperientialism; phenomenal powers; Russellian monism; causal constraints; transport test; metaphysical underdetermination.

Contents

- | | |
|--|--|
| 1. Question and evidential standard | 8. Applying the transport test |
| 2. What counts as reconstructing prehension? | 9. Evidence, identifiability, and next tests |
| 3. A positive causal account without experiential premises | 10. Comparative evidence matrix |
| 4. Worked scientific cases | 11. Result, limits, and falsifiers |
| 5. Pressure on the positive rival | 12. Selected primary-source excerpts |
| 6. The strongest experiential case | 13. Computational implementation schema |
| 7. The transport test | 14. References |

1. Question and evidential standard

Position and burden. The shared carrier D includes process, relation, causal production, organization, and experience where it is independently evidenced. D is a reconstructed comparative overlap, not an actual occasion extracted intact from Whitehead's theory after removing its constitutive feeling, and it is not proposed as a metaphysically neutral final ontology. It is neutral only with respect to the disputed addition X at the targets being compared. X claims that concrete causal actuality throughout nature is constituted by Whiteheadian prehensive occasions, so that causal efficacy everywhere is felt inheritance. **?X is not a third ontology.** It separates truth status from adoption status: the truth of X remains unresolved, while adoption of X is provisionally withheld because its universal scope has not earned assent on the case examined. The same distinction applies to $\neg X$: an exhaustive nonexperiential ontology would owe its own universal-scope warrant.

What “open” means. Open means that the proposition's truth remains unresolved by the arguments examined here. It does not imply equal support for all rivals or neutrality about present adoption. Withholding assent from X and withholding assent from $\neg X$ are compatible; the SEP account of skepticism distinguishes suspension from disbelief, while the SEP account of underdetermination records disagreement about how rival possibilities should alter belief.

Why undertake the positive comparison? A universal claimant owes reasons for universal scope, but the present paper takes on an additional burden of its own: testing the stronger allegation that causal production without subjective prehension cannot be characterized positively. Sections 3-4 supply positive accounts at specified targets. Their success

defeats an indispensability claim at those targets without establishing $\neg X$, a complete rival cosmology, or the bearers' intrinsic nature.

Methodological consequence. The comparison does not discard Whitehead's speculative programme; it removes premise privilege from its universal experiential extension. Applying Whitehead's stated criteria of coherence, logical consistency, applicability, and adequacy to X itself, while also taking Segall's explicit loss condition seriously, leaves a substantial independently warranted carrier D and treats universal prehension as a further hypothesis. X is unnecessary as a premise for the causal targets established in sections 3-4 without thereby being shown false. This separation permits Whiteheadian questions about causal inheritance, organization, subject formation, valuation, and experiential continuity to be investigated independently, rather than requiring a completed universal metaphysics before target-specific progress is possible.

The dispute contains three questions that should not be collapsed. First, can causal dependence, production, and organization be specified without experiential predicates? Second, can that specification be positive rather than a bare regularity? Third, does it exhaust the intrinsic nature of actuality? The accounts examined answer the first two positively for their stated targets. The third remains unresolved.

Scope rule. Explanatory dispensability of X for target T does not entail the absence of X. Explanatory gain from X at source S does not entail X at target T.

Contrastive credit. The comparison asks what explanatory work is attributable to the distinctively subjective commitment against a matched rival. X earns distinctive credit where retaining it improves prediction, derivation, restriction of possibilities, explanatory compression, robustness, unification, principled grounding, reduction in independent assumptions, or another specified target. This is not a demand that metaphysics produce a novel laboratory signal at every step. Whole-scheme abductive comparison is legitimate when component ablation is not, but a comparative win for a package does not automatically identify which component earned the win. Holding X tentatively changes confidence, not the universal range of the claim.

Abductive baseline and terminology. Predictive and interventionist successes directly support the physical causal descriptions that generate them within tested domains; they do not by themselves establish exhaustive nonexperiential intrinsic reality. Conversely, a Whiteheadian interpretation cannot inherit those successes as X-specific evidence merely by accommodating them. "Without prehension" below means without prehension as an explanatory or ontological premise. Such accounts may remain compatible with experience in some or all bearers while being complete for a specified target and incomplete about intrinsic nature.

2. What would count as reconstructing something equivalent to prehension?

Whitehead's own categorical scheme makes the target more precise than the generic idea of "receiving influence." In *Process and Reality*, every prehension contains a **subject, datum, and subjective form**; positive prehensions are feelings; and a simple physical feeling is explicitly treated as an act of causation. Consciousness in the reflective sense is not required. The *subject* here is not a Cartesian ego that exists prior to the relation: Whitehead says that in the philosophy of organism "the subject emerges from the world" and that *subject* is an abbreviation of *subject-superject*. The point is confirmed by the current SEP account of Whitehead and by the IEP entry on process philosophy, both of which characterize Whitehead's actual occasions as experiential down to the constituents of apparently lifeless nature.

"Consciousness is not necessarily involved ... positive prehensions ... are termed 'feelings.'"

Whitehead, *Process and Reality*, Part I, ch. II, Categories of Explanation (xi)-(xii).

"A simple physical feeling is an act of causation."

Whitehead, *Process and Reality*, Part III, ch. II.

Semantic gateway. Within Whitehead's scheme, positive prehension and feeling belong to the constitution of an actual occasion. Their theory-internal connection does not itself establish that the causal processes studied across nature are constituted by such occasions. That is the externally contestable scope claim. A transported *feeling* must retain a meaning distinct from causal sensitivity or selective integration, while also not being confused with human painful qualia. If it reduces to the former, the X-specific content disappears; if no stable cross-domain feature can be stated, the target claim is underspecified. A coherent technical definition is not independent evidence that its proposed referent is instantiated in every causal domain.

Why this threshold is not stipulation. The criterion is anchored to Whitehead's own account of what makes prehension more than generic causal sensitivity. If *prehension* is broadened until selective response, integration, or historical dependence alone qualifies, the distinctively experiential content of X has been abstracted away. If the Whiteheadian structure is retained, then subject, datum, and subjective form remain part of what the universal claim says is instantiated. The criterion therefore preserves the disputed referent rather than choosing a definition designed to exclude Whitehead.

Terminological invariance. In this paper *causal inheritance* is neutral shorthand for target-level causal dependence, production, or historical influence without presupposing Whitehead's interpretation. *Felt inheritance* names the stronger Whiteheadian identification of causal efficacy with positive prehension under subjective form. A correction that replaces shorthand with Whitehead's exact vocabulary - *positive prehension*, *simple physical feeling*, *subjective form*, *concrescence*, *causal efficacy*, or *subject-superject* - is substantive only if it changes the referent, the inferential bridge, or the comparative result. Merely redescribing the same scope claim in preferred terminology does not answer whether the relevant Whiteheadian structure is instantiated throughout nature.

That means a non-experiential rival does not avoid Whitehead merely by replacing the word *prehension*. It must avoid building the disputed experiential feature into its ontology under another name. At the same time, Whiteheadian equivalence cannot be defined so broadly that every causal relation counts as prehension. If it were, a charge that all rivals "implicitly rely on prehension" would become terminological rather than discriminating.

Level	Minimal commitment	Experiential commitment?
Causal dependence	What happens to one process depends on conditions or events elsewhere.	No.
Selective incorporation	A process's organization determines which influences alter its subsequent trajectory and how.	No.
Whiteheadian prehension	The becoming subject takes a datum under a subjective form; positive prehension is feeling.	Yes, in Whitehead's technical sense.

Accordingly, the equivalence criterion used here is functional *and* ontological. A rival reconstructs the disputed component only if causal uptake occurs within the concrescence of an actual entity in a way that preserves something equivalent to Whitehead's subjective form or positive prehension. Historical dependence, integration, selective response, and inheritance by themselves do not meet that criterion. This does not require a pre-existing ego or reflective consciousness.

Comparative caution. Whitehead's technical "feeling" of an actual occasion is not equivalent to a human painful quale. A universal Whiteheadian bridge need not attribute human aversiveness to electrons or bacteria, nor is an enduring electron identical to one occasion: in Whitehead's scheme enduring objects are societies or routes of occasions. The bridge must instead identify an invariant that is *still distinctively subjective* across scales, such as the relevant subjective form, and show what warrants it in the target. The present criterion tests that invariant rather than demanding the same sensory quality everywhere.

3. A positive causal account without an experiential premise

No single paper below endorses the synthesis in this section. It is deliberately assembled from partially independent programs so that its adequacy can be tested rather than stipulated. Its components are productive mechanisms, real powers or modal structure, organization and constraints, and intervention-sensitive differentiation.

3.1 Productive activity rather than bare succession

Machamer, Darden, and Craver's new-mechanist account is a useful starting point because it does not reduce explanation to correlation. Mechanisms contain entities and activities whose organization is productive of change. Activities are not passive labels for temporal succession; their arrangement, location, rate, and order matter to the phenomenon generated.

"Mechanisms are entities and activities organized such that they are productive of regular changes ..."

Machamer, Darden, and Craver (2000), p. 3, doi:10.1086/392759.

At the targets it explains, this account is a counterexample to the claim that an explanation without presupposing prehension must reduce to empty succession: it specifies concrete bearers, activities, organization, and productive continuity. It does not purport to settle the complete intrinsic metaphysics of causation.

3.2 Powers and modal structure

Dispositionalist and causal-powers approaches add a modal commitment: what a property or structure is partly concerns what it can do, how it can manifest, and how it reacts under relevant conditions. The SEP entry on dispositions distinguishes such accounts from categorical views on which causal roles are merely contingently attached. Esfeld gives one explicit structural-realist completion by construing physical structures as causal powers rather than merely mathematical structures.

"the fundamental physical structures possess a causal essence, being powers."

Esfeld (2009); doi:10.1080/02698590903006917.

This paper does not assume that Esfeld's metaphysics is correct. His proposal supplies one positive powers account without subjective prehension as a premise. It says more than "something happens": concrete physical organization can be modally directed toward determinate classes of manifestation. The SEP literature on structural realism supplies a broader alternative in which objective modal structure can concern necessity, possibility, potentiality, probability, symmetry, and constraint without requiring phenomenal character.

3.2a A direct process-and-power rival

The synthesis need not stand alone. Dupré proposes that, for a central class of biological cases, causal interaction is the exercise of capacities inherent in persistent processes, while explicitly resisting a machine-like ontology of fixed parts. Esser (2026) develops a closer cross-domain process ontology: dispositions propagate in processes and mutually manifest in interactions, altering the participating processes' profiles. In Esser's formulation, a process "propagates a bundle of dispositions between interactions" (sec. 2). This gives a proposed constitutive story of production and persistence, not just a model of a phenomenon. Dupré cautions that his detailed defense is primarily biological; Esser does not establish that his proposed ontology is true or exhausts intrinsic nature. Both are more direct comparators to Whitehead than Hodgkin–Huxley alone. Dupré (2021); Esser (2026).

3.3 Constraints, organization, boundaries, and timescale

Montévil and Mossio make the positive account more concrete and scale-sensitive. They distinguish processes, which undergo change, from constraints, which act on processes while remaining relatively conserved at the timescale relevant to that causal role. Biological organization arises when constraints depend on and help maintain one another. This supplies a causal vocabulary for boundary formation and self-maintenance without treating concern, feeling, or subjectivity as premises.

"constraints realise closure, i.e. mutual dependence such that they both depend on and contribute to maintaining each other."

Montévil and Mossio (2015); doi:10.1016/j.jtbi.2015.02.029.

Their framework is especially important for avoiding scale slips. A feature can function as a constraint only relative to a process and a timescale. Causal description is therefore indexed to a boundary and timescale rather than automatically projected from microphysics to cells, organisms, or agents.

3.4 Intervention-sensitive differences

Interventionist accounts add an epistemic test rather than an ultimate metaphysical ground. The current SEP entry emphasizes that modern interventionism is non-reductive: an intervention is itself characterized causally. Its contribution is to sharpen claims about what would change under a controlled change in a putative cause while relevant background relations are held fixed. This makes causal commitments answerable to differential tests without pretending to derive causation from non-causal vocabulary.

3.5 Positive synthesis at specified targets

At boundary B and timescale tau, define a causal system by concrete processes P, instantiated capacities K, organizational constraints C, and actual or counterfactual transformations M. Then a minimal positive account is:

CausalActuality(B, tau) = concrete exercise and interaction of K within P, under C, such that differences in K, C, or relevant conditions make differences to the accessible or actual transformations M.

Nothing in that formulation requires a subject of experience. It also does not forbid one. Experience remains an additional question about some or all bearers of the causal organization.

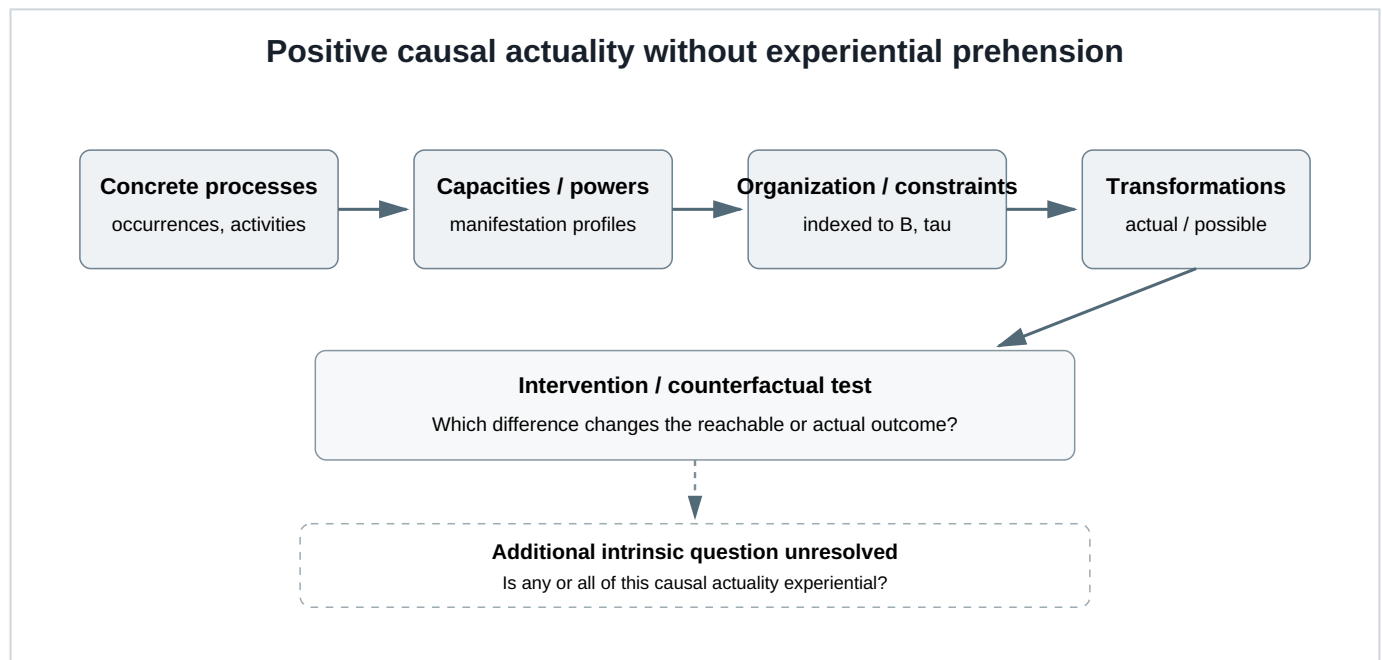


Figure 1. The proposed rival is positive about processes, causal capacities, organization, constraints, and transformation. Experiential character is neither assumed nor denied. The dashed branch marks a residual metaphysical question rather than an explanatory premise.

4. Worked scientific cases: what the rival can actually explain

The cases in this section are not a miscellaneous catalogue of scientific successes. They are selected to vary the evidential relations at issue in the scope inference. Hodgkin-Huxley examines richly structured causal dynamics in a system closely associated with experience; organizational closure moves to living self-maintenance and boundary formation; gravitational-wave prediction tests a remote lifeless domain where causal structure has direct predictive support; and the later pain comparison returns to a domain where phenomenality itself is independently evidenced. Across the sequence, proximity to known experiencers, degree of organization, direct evidence of phenomenality, and causal-predictive support change while the target question is held fixed: where, if anywhere, does the specifically subjective feature make a discriminating explanatory difference? These are matched conceptual comparisons, not controlled experiments.

4.1 Hodgkin-Huxley nerve excitation

Hodgkin and Huxley's 1952 model is useful because it exhibits temporal dependence, selective response, feedback, changing conductances, and experimentally constrained dynamics in one of the canonical systems later associated with experience. Their stated aim was to transform preceding voltage-clamp results into a mathematical system and test whether it reproduced conduction and excitation quantitatively.

"to put them into mathematical form ... and to show that they will account for conduction and excitation in quantitative terms"

Hodgkin and Huxley (1952), p. 500; doi:10.1113/jphysiol.1952.sp004764.

The resulting equations specify how membrane voltage depends on capacitance, ionic driving forces, and state-dependent sodium, potassium, and leak conductances. Their quantitative success directly supports the physical causal description and gives physicalist approaches explanatory credit at that target. A prehending subject, subjective form, or feeling is not a premise or variable of the model. An added Whiteheadian interpretation requires a distinct reason to receive credit for the same result.

4.2 Biological organization and self-maintenance

Montévil and Mossio provide an analogous case at a higher biological scale. Constraints such as membranes, enzymes, and circulatory organization can channel thermodynamic processes while being maintained by processes within the same organized system. Closure then supplies a criterion for system boundaries. Boundary maintenance and organizational dependence thus have a positive causal explanation without felt concern as a premise.

4.3 A physical prediction beyond the local experiential domain

The observed gravitational-wave signal from a distant binary black-hole merger matched the waveform predicted by general relativity. This is a separate example of a physical account succeeding far beyond terrestrial experiential cases; it does not reveal the intrinsic character of the source. Its evidential role here is to establish the asymmetry in tested reach: physical causal descriptions receive direct predictive support there, while the additional claim that the relevant actuality feels is not established by that matching waveform. Abbott et al. (2016).

Interim result. Mechanistic production, dynamical dependence, organized self-maintenance, and intervention-sensitive causal difference can be specified without subjective prehension. These demonstrated successes count for the physical descriptions at their targets; whether their bearers feel remains the disputed additional claim.

5. Pressure on the positive rival

5.1 "It is still only structure"

The strongest objection is not that the rival says nothing, but that everything it says may concern structure, role, or manifestation while leaving intrinsic nature untouched. Structural realism makes that pressure explicit. Some structural realists treat modal structure itself as ontologically sufficient; Russellian monists instead infer quiddities or intrinsic

properties not exhausted by structural description. The literature therefore does not license the simple equation "positive = phenomenally acquainted." It presents rival standards of positive intelligibility.

The positive account defended here is sufficient for a limited target: what causal systems are doing, which possibilities their powers and constraints permit, and which differences matter to transformations. It is not offered as a derivation of why there is actuality at all, why fundamental modality obtains, or why experience exists.

A challenge from within the rival camp. Dupré accepts mechanistic explanations of particular capacities while rejecting mechanisms as a general metaphysical picture of living processes: biological parts are made and altered by ongoing wholes (Dupré 2021, sec. 1–2). Esser uses powers to make causal interaction concrete, but this moves the primitive to a dispositional profile and mutual manifestation; it does not derive why such powers obtain. Accordingly, the present synthesis should be read as a family of compatible explanatory resources, not as a derivation of a single final ontology from mechanism, interventionism, and powers. Explanatory models, causal tests, and metaphysical claims have different evidential roles.

5.2 Powers can also overtravel

Symmetry matters. Bird's critique of powers metaphysics warns against taking arguments for powers at one level and freely projecting them onto phenomena at another. His distinction between abstract arguments for fundamental powers and specific applications at macro levels is almost a ready-made warning against the same transport error this paper later applies to experientiality.

"does not provide the insight claimed as regards the aforementioned non-fundamental phenomena."

Bird (2016); doi:10.1093/mind/fzv207.

Accordingly, the present paper does not infer from a powers interpretation of fundamental physics that every biological or psychological property is a macro-power of the same type. At each boundary and scale, the bridge must be supplied. The transport rule is substrate-neutral and ontology-neutral.

Bird's objection is disputed. Mumford (2021) argues in direct reply that the objection restricts powers too narrowly and overlooks proposed explanatory roles for powers beyond fundamental physics. Mumford says the wider view can give "illuminating accounts of many phenomena of philosophical interest" (sec. 1); the phrase does not, by itself, establish any particular higher-level power. The symmetric transport rule therefore asks both sides to specify how a power or a feeling explains the target rather than treating either Bird's warning or Mumford's response as settled. Mumford (2021).

6. The strongest experiential alternative

6.1 Whitehead's unification and direct causal-efficacy route

Whitehead's proposed comparative advantage is ontological continuity rather than an extra force added to physics. In his scheme causal becoming, inheritance of the past, selective integration, valuation, and experience belong to a single process architecture. The SEP Whitehead entry characterizes this as panexperientialism: the elementary constituents of lifeless as well as living things are experiential, though not necessarily conscious in the ordinary reflective sense. The

scheme offers a way to avoid positing a sharp bifurcation in which experience appears from a base characterized as wholly alien to it.

Whitehead's direct route is stronger than an associationist inference from repeated sensory sequences. His distinction between *presentational immediacy* and *causal efficacy* is meant to show that bodily inheritance, compulsion, memory, and influence can be directly experienced even when causal relation is not presented as a clear sensory object. The flash-and-blink case and the bodily examples therefore deserve to be granted as phenomenological evidence against a narrowly sensationalist picture of perception. This paper does not explain them away as mere correlation.

Segall's 2019 peer-reviewed exposition makes the scope transition explicit. He treats human causal efficacy as a specific example from which the proposed generic nature of nonhuman causal relations can be grasped, and describes the example as "imaginatively extended so as to characterize the becoming of actual occasions at every spatiotemporal scale". Segall (2019). The external question examined here begins at that imaginative extension, not at the local claim that causal efficacy can be directly felt in human bodily experience.

Segall's 2020 discussion (pp. 123-126) takes felt bodily causal reception, including the experienced weight of a stone in a hand, as a clue to causation in the rest of nature. The local phenomenology deserves its place in the evidence. Its extension, however, needs a further bridge: the fact that a concentering subject feels the stone's causal effect does not establish that each contributor to that causal route, or analogous routes in lifeless domains, is itself constituted by positive prehension under subjective form. That point does not settle the universal possibility; it locates the warrant needed for the scope inference. Segall (2020), author text.

The strongest epistemic version of the argument should also be granted. Felt causal reception is at least one candidate intrinsic character with which subjects have direct acquaintance, whereas physical theory often specifies relational, structural, and dynamical features. That can make an experiential completion less arbitrary than an invented unknown quiddity and can increase its abductive attractiveness. But **known candidate is not the same as uniquely admissible completion**, and acquaintance with one intrinsic mode does not establish universal instantiation. The further step requires either a reason that the experiential candidate is uniquely privileged or a comparative gain that serious rivals cannot match.

That is a proposed abductive virtue, conditional on a coherent account of the relevant unity and boundaries. A rival may maintain continuity in powers, process, and modal organization while allowing phenomenal organization only under some conditions. The tested physical record supplies an evidential baseline for those shared causal structures. The question for X is which further explanatory constraint or unification specifically depends on universal feeling. A complete ranking of cosmologies would additionally compare how each explains the existence and character of experience, not merely conduct.

6.1a Deacon's organization challenge and Segall's reply

Terrence Deacon's *Incomplete Nature* (2011/2012, pp. 77–79) directly considers Whitehead. Deacon allows that Whitehead distinguishes a brain from a river by the special organization of its society of occasions, and argues that primitive micro-level intentionality then appears to add little to the explanation of this difference. He also concedes that the distinctively mental attributes still need an explanation in terms of organization. Segall (2020, pp. 119–120) puts Deacon's objection on the page, credits the rival with narrowing the distance between causality and intentionality, and replies that a gap remains: prehension is intended to interpret the very possibility of causal relation as well as conscious organization. This is an already published exchange over the exact incremental-credit question at issue here. Deacon, *Incomplete Nature*; Segall (2020), author copy.

The targets must be kept apart. Organization may explain differences between brains and rivers while leaving unresolved why an organized subject has any phenomenality; an intrinsic process account may address that latter question without yet showing why every concrete causal process must be constituted by felt occasions. Deacon does not show that organizational explanations suffice for consciousness, and Segall's identification of a residual gap does not establish that universal prehension closes it. A decisive comparative argument would specify the experiential phenomenon, say how each view explains it, and locate the additional gain due to primitive feeling after shared organizational resources are counted.

Nor does a rival's outstanding explanation of human experience, by itself, identify the intrinsic character of causal actuality throughout nature. Treating that gap alone as support for universal X would substitute an absence in one account for a bridge in the other. The comparative route remains open: primitive feeling could earn credit through a specified unification or constraint that competing accounts cannot match without greater costs.

6.2 Mørch: phenomenal powers and affective motivation

Mørch supplies the strongest local experiential case in the literature examined here. Her 2017 evolutionary argument proposes that phenomenal properties can be intrinsically powerful. Pain and pleasure are the central examples because their felt character seems to make avoidance and pursuit intelligible rather than merely correlated.

"pain makes subjects who experience it try to avoid it simply in virtue of feeling bad"

Mørch (2017), sec. 5; doi:10.1111/phpe.12096.

Fix the local target. The operative claim concerns *trying*, not invariably successful avoidance. Distinguish nociceptive input, sensory intensity, unpleasantness, desire or volition, action selection, and motor success. A competing goal can outweigh an aversion; a motor impairment can prevent its expression. Neither case alone disproves a qualified intrinsic motivation thesis. Conversely, a theory must specify its masking and background conditions independently of each apparent counterexample, or its purported necessity loses discriminatory content.

Her later dispositionalist argument presses directly on the powers rival. Instead of accepting that dispositions can be positively understood without categorical grounds, she argues that motivational phenomenal properties are the only fundamental dispositions of which we have positive conception.

"The only fundamentally dispositional properties we know or can positively conceive of are phenomenal properties."

Mørch (2020), sec. 4.2 and conclusion; doi:10.1007/s11245-018-9604-y.

If these claims hold, phenomenality is not merely an optional intrinsic filling. It supplies positive acquaintance with causation and may explain psychophysical harmony in a way epiphenomenal alternatives cannot.

6.2a A direct challenge to the evolutionary argument

Zietsch (2024) argues that Mørch's thought experiment can mix an imagined injury with the sensation itself and that lifelong learning can make the fit of pain and avoidance appear intrinsic. He proposes "sensational associative learning" as an alternative account of the adaptive-seeming alignments (sec. 4–5). His case is more directly addressed to Mørch's evolutionary argument than Goff's narrower introspection objection. But his own proposal is not experimentally

established in that article, and examples of sought sensory pain do not automatically disprove a thesis about *aversive unpleasantness*: Mørch restricts her target to phenomenologically normal pain. The comparison needs prospectively specified interventions or dissociations that distinguish learned appraisal from constitutive aversive power while holding nociception and motivational context apart. Zietsch (2024).

6.3 Goff: the local advantage is not settled

Goff argues that introspection does not reveal pain, considered in isolation, to have an essential behavioral disposition. He proposes a richer pain+ property in which phenomenal and nonphenomenal aspects may jointly contribute. His alternative also allows the seeming fit of unpleasantness with avoidance to be normative rather than a directly perceived causal necessity. This challenges Mørch's specific claim of introspectively accessible intrinsic power, while leaving open phenomenal efficacy within a joint property.

"When I reflect on how pain feels, I can find no necessary causal connection with any kind of behavioural effects."

Goff (2020), sec. 2; doi:10.1007/s11245-018-9594-9.

The local conclusion must be a contested explanatory comparison. In particular, Goff's "consciousness+" can preserve local efficacy, and Gozzano's realized phenomenal disposition can preserve it without fundamental panpsychism. Introspection alone does not select among these candidates.

6.3a Goff's own concession and a stronger comparative objection

Goff's objection is narrower than an argument for the causal idleness of phenomenality. He explicitly allows phenomenal feeling to contribute causally as part of the larger pain+ property (Goff 2020, sec. 2). He also restricts his introspection argument to a Revelation-committed powers theorist and distinguishes a normative link from a necessary causal link. The defensible pressure point is therefore contrastive: what rule assigns the contribution to phenomenal character, rather than to the joint property or its nonphenomenal aspect, and which counterfactual would distinguish these accounts? Goff's failure to introspect a necessity is evidence against one proposed introspective inference; it neither proves that phenomenal powers are absent nor explains the affective alignment by itself.

Simone Gozzano's competing account strengthens this comparison. He argues that bodily pain is "a non-fundamental yet causally efficacious dispositional property" (2021, sec. 1). His proposed phenomenal roles are realized in physical organization and explain pain's biological relevance without positing fundamental phenomenal powers in lifeless matter. This is a philosophical proposal, not an empirical demonstration of identity or a settled analysis of pain; its conditions of individuation face mad-pain, asymbolia, and masking challenges. It nevertheless forces Mørch's universal inference to beat a rival that grants local phenomenal efficacy. Gozzano (2021).

6.4 Dondoni: combining intrinsic quality with efficacy creates a new burden

Dondoni's attempt to reconcile categorical and dispositional arguments for Russellian panpsychism reveals another tension. On his compound-property route, qualitative and dispositional aspects can be distinguished, but that makes it possible for the phenomenal part to cease doing the causal work that motivated the experiential proposal in the first place.

"the phenomenal parts of properties ... are entirely inefficacious towards the physical world"

Dondoni (2022), sec. 6.2; doi:10.1007/s11406-021-00363-1.

Dondoni argues that a benign version of this consequence can be tolerated. For the present comparison, the important point is diagnostic: saying that phenomenal character supplies intrinsic nature while a separate dispositional component supplies efficacy does not automatically establish that phenomenality explains efficacy.

Scope of Dondoni's result. The epiphenomenal consequence concerns the separated phenomenal component in his *compound-property reconciliation*. Dondoni himself defends its grounding role and calls that limited epiphenomenalism tolerable. It does not follow that every powerful-quality or Whiteheadian account makes experience idle.

6.5 Baysan: mental causation is not an established panpsychist discriminator

Baysan directly tests a frequently advertised comparative advantage of Russellian panpsychism: that it explains mental causation better than competing non-physicalist theories. His conclusion is negative. Either the proposed explanation targets micro-level causal efficacy rather than the macrophenomenal phenomenon at issue, or analogous explanations are available to competitors.

"Russellian panpsychism's superiority in explaining mental causation over competing accounts is illusory."

Baysan (2025); doi:10.1007/s10670-024-00816-5.

Baysan directly targets *Russellian panpsychism*, so his result bears on a specific proposed mental-causation advantage rather than Whitehead's entire categorical scheme. His dilemma asks whether micro-level efficacy addresses macro-level mental causation; if constitution is added, rival accounts can invoke their own grounding or psychophysical relations. The comparison credits his argument at the target and scope he actually examines.

Adversarial counterweight. Alter and Coleman (2021) defend Russellian monism against two arguments that contingent links between quiddities and dispositions entail epiphenomenalism. They conclude, "We argue that neither succeeds." This is a live defense, not evidence that Baysan's different comparative argument has been answered or that universal experience is established. Alter and Coleman (2021).

6.6 What Revelation can and cannot establish in this comparison

Three transitions need separate warrants: acquaintance with phenomenal character to knowledge of its essence; such knowledge to its causal or grounding relations; and a local result to universal experientiality. These are not interchangeable with the modest claim that subjects can know how an experience feels. Morris (2022) challenges the strong super-justification needed for Goff's transparency argument while allowing a weaker thesis compatible with physicalistic phenomenal-concept accounts. Damnjanovic (2012) also argues that robust readings of Revelation can be compatible with physicalism. These are challenges to particular inferences, not demonstrations that experience teaches us nothing. Morris; Damnjanovic.

The opposition is not unanimous. Roelofs (2020) defends qualified Revelation as compatible with constitutive panpsychism, distinguishing revealed phenomenal nature from inaccessible constitution and attentional limitations. His

stated aim is a thesis “strong enough to bring down physicalism but weak enough to leave constitutive panpsychism standing.” Lin (2026, online 2025) argues that an essence/grounds distinction either fails to save panpsychism or also saves physicalism. Their disagreement makes the parity question sharper: which independently defended epistemic or grounding asymmetry distinguishes the rivals? Neither a bare appeal to introspective certainty nor a general appeal to introspective fallibility settles it. Roelofs; Lin.

This narrow issue is relevant to the paper because phenomenal powers appeal to what acquaintance reveals about causation. It does not warrant importing personal debate allegations, religious analogies, or a purported consensus refutation of panpsychism. Goff's 2020 position is itself a criticism of one phenomenal-powers argument, not an endorsement of every inference criticized here.

Epistemic residual route. The paper therefore does not treat first-person acquaintance as evidentially worthless. It can make phenomenal character a serious candidate for intrinsic causation. What it does not establish by itself is uniqueness or universal scope. Moving from "this is an intrinsic character with which we are acquainted" to "this is the intrinsic character of causal actuality generally" remains a transport claim requiring an additional bridge.

7. The transport test

The central methodological question can now be stated without favoring either side:

Transport question. Which feature makes the source explanation better, and what warrants claiming that the same feature explains the target? If that feature disappears during abstraction, the original advantage cannot simply accompany the generalized vocabulary. If it survives, demonstrating its presence and explanatory contribution is the next substantive task.

Let S be a source domain where an explanatory advantage is claimed, T a target domain, D the strongest shared or rival explanatory base, and F the disputed feature credited with the advantage. Let Q represent a specified explanatory criterion, such as predictive restriction, causal derivation, compression, robustness, or intelligibility of an independently identified target. Then source credit requires a contrastive gain:

$$\Delta_S(F) = Q(D + F, S) - Q(D, S) > 0 \quad [\text{for the chosen } Q]$$

No numerical metric is assumed. The expression only forces the comparison to identify what changed. It applies directly only where D and D+F are legitimate nested comparators. More generally, compare complete accounts M_F and M_R with matched targets, evidence, and explanatory costs. A realized phenomenal role may earn explanatory credit without adding an independently variable causal ingredient. Transport requires a defended mapping of the credit-bearing feature and comparative warrant at the target, not an assumption that every scale has the same quality.

The Q expression is a bookkeeping device, not a measured score or a requirement that every metaphysical claim predict a novel laboratory result. A gain can concern a clearly identified explanandum, a non-circular grounding relation, or reduced independent assumptions; its costs and rival explanations must be counted on the same terms. An ontology can be rationally preferred abductively without independently observing its hypothesized intrinsic character at every target. Such abductive transport still needs a specified bridge and comparative reason; demanding direct first-person access at each scale would preclude nearly all metaphysical inference.

7.1 Six transport conditions

Condition	Question	Failure mode
T1. Source discrimination	What exactly does F explain in S that D alone does not?	The supposed advantage is shared background structure.
T2. Feature preservation	Does the mapping S → T preserve the feature that did the work?	Phenomenality becomes generic directedness, response, or integration.
T3. Target warrant	What warrants F in T beyond restating universal X?	The universal hypothesis is used as evidence for itself.
T4. Target discrimination	What is better explained, predicted, constrained, or unified in T because F is retained?	D+F and D make no relevant comparative difference.
T5. Rival non-equivalence	Can the strongest non-experiential rival reproduce the gain with modal or organizational resources?	The experiential vocabulary redescribes a rival resource.
T6. Boundary/scale validity	What is preserved or lost when moving between organisms, cells, molecules, fields, or fundamental structures?	Composition/division or scale inheritance is assumed rather than bridged.

T4 is differential credit, not experimentalism. It does not require a novel laboratory prediction at every metaphysical target. A genuinely X-dependent unification, principled grounding relation, reduction in independent assumptions, explanatory compression, or restriction on admissible models can satisfy T4. The requirement is that the comparative gain belong to the feature being credited rather than to structure shared by both accounts.

7.2 The transport fork

For phenomenal powers, three *presentational* routes produce only two epistemic outcomes. **Abstraction:** the source feature is thinned into dispositional directedness, responsiveness, selective integration, or causal inheritance; then the feature that earned experiential credit has disappeared into resources already available to rivals. **Determinable preservation:** a thin but genuinely subjective invariant - for example positive prehension under some subjective form - is retained while human pain, color, reflective awareness, and other familiar qualities are treated as determinates. This remains on the experiential preservation branch and requires T3 and T4. **Determinate preservation:** a richer phenomenal feature is carried into the target; it likewise requires target warrant and comparative contribution. The fork is therefore not human-like phenomenology versus abstraction. It is whether a genuinely subjective credit-bearing feature survives at all.

Evidential-gradient rule. The transport problem becomes more severe, not less, as the target recedes from independently established experience. Where phenomenality is independently evidenced, its local causal interpretation remains contested; moving toward living organization and then lifeless physical domains, causal structure can remain strongly evidenced while direct support for the specifically experiential feature decreases. This is not evidence that the feature is absent. It is a restriction on transported credit: a missing X-specific advantage at the evidentially strongest source cannot be inherited by a more weakly evidenced target merely by expanding the scope of X. If feeling is thinned

into generic sensitivity, directedness, integration, or inheritance, X-specific content is lost; if genuine subjectivity is preserved, T3 and T4 remain to be satisfied.

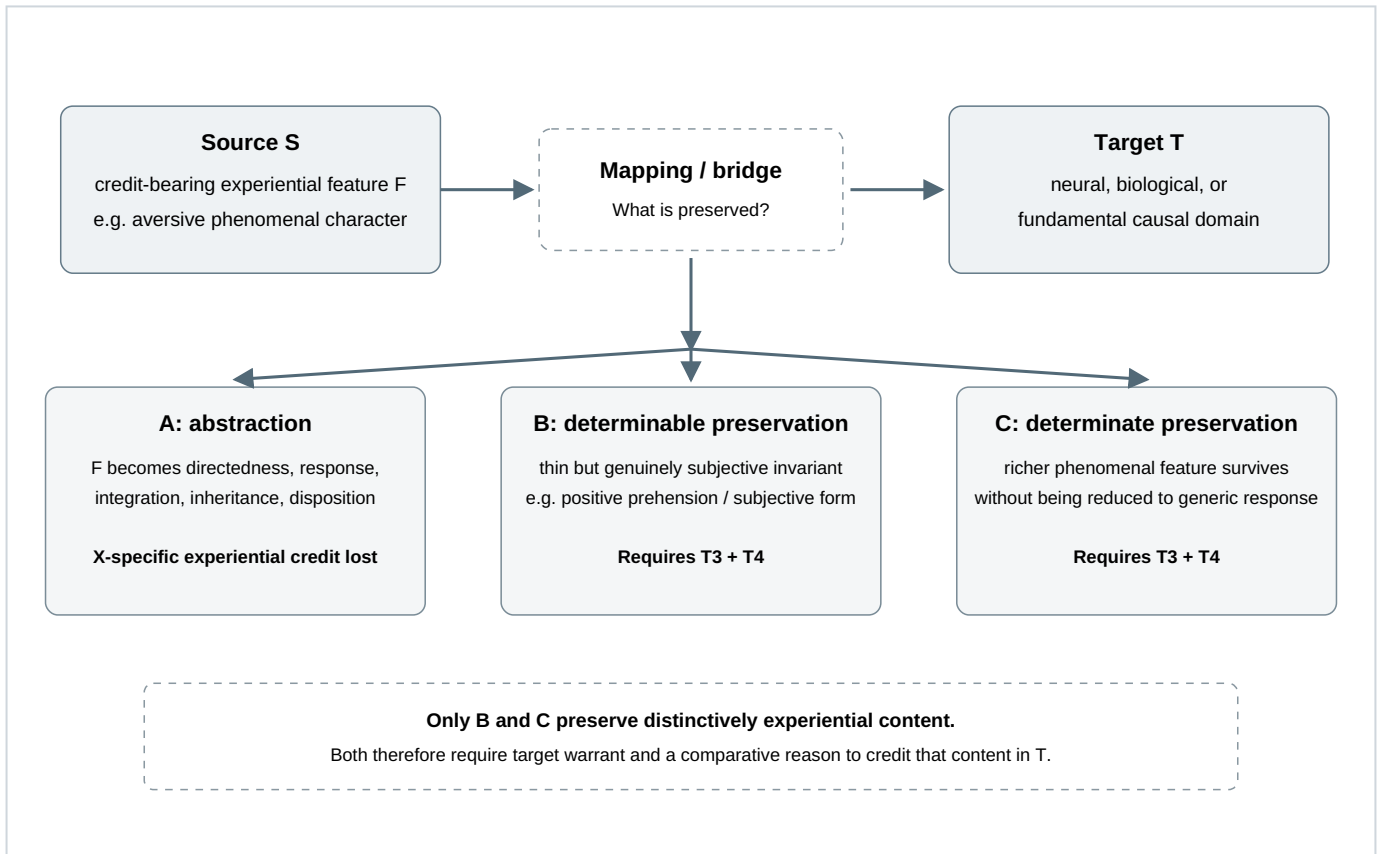


Figure 2. The transport test distinguishes abstraction from two forms of experiential preservation. A thin subjective determinable is not a third epistemic escape: if it remains genuinely subjective, it still requires target warrant and differential contribution; if it becomes generic causal responsiveness, it has crossed into abstraction.

7.3 Identifiability before experimental discrimination

Analytical condition proposed here. Let O denote the complete measured outcome vector, I the specified set of admissible interventions, and M_F and M_R fully specified rival models, including their measurement and sampling assumptions. If they assign the same distribution to O under every intervention in I , those observations cannot discriminate them by likelihood:

For every i in I :
 $P(O \mid \text{do}(i), M_F) = P(O \mid \text{do}(i), M_R)$
 $\Rightarrow$ equal likelihoods for data collected under that design.

This is a conditional identification limit, not a finding that all phenomenal and physical theories are equivalent. For composite models, equal fitted predictions at one parameter setting do not establish equal model evidence: parameter restrictions and prior distributions also matter. A proposed test must first specify a difference the models actually entail.

Otherwise a correlation, intervention effect, or successful neural prediction can be accommodated by each ontology. Other abductive considerations remain available, but should not be described as experimental discrimination.

Falsifiers and other challenges. No specified direct observational falsifier is supplied for X in its broad formulation; that is narrower than declaring X immune to every conceivable disproof or criticism. Its concepts can be checked for coherence, its universal application challenged by comparison, and a sharpened theory could yield discriminating empirical consequences. Popper's falsifiability criterion concerns empirical science; he allows that metaphysical proposals may still be illuminating. A lack of direct laboratory falsification neither establishes X nor invalidates every possible abductive case for it. SEP, Karl Popper.

Three kinds of claim, three evidential burdens. Provisionally rejecting adoption of X as warranted on the case examined, while suspending judgment about its truth, calls for appraisal of the reasons offered for its universal scope; it asserts no $\neg X$ ontology. The paper's further claim that prehension is unnecessary as a premise for a specified causal target calls for a positive, target-matched account, which sections 3–4 provide. A claim that one complete cosmology ranks above another would require comparison across causal production and independently evidenced experience, including phenomenality, valence, subject boundaries, and organizational dependence. That third claim is not made here. Whitehead's initial criteria for speculative philosophy include coherence, logic, applicability, and adequacy (*Process and Reality*, Part I, ch. I, sec. I). A metaphysical case can therefore earn abductive credit without a novel laboratory prediction, provided the gain belongs to its distinctive universal experiential commitment rather than to shared process structure. Whitehead (1929/1978).

Why the comparison itself needs caution. Stanford (2001) challenges unrestricted confidence in the rivals we have already conceived, using historical episodes rather than a claimed proof that every theory has an empirically equivalent competitor. Davey (2024) argues that ranking the best theory among a poor set need not warrant believing it. Woodward (2025) offers a stronger, distinct position: a would-be explanation's potential explanatory power alone does not establish that it is true or effectively correct. These are live methodological disagreements, not a consensus verdict against inference to the best explanation. This paper uses specified contrast classes to assign limited, revisable credit and records the remaining unexamined alternatives. Stanford (2001); Davey (2024); Woodward (2025).

Four distinct achievements. An effect of an experimental manipulation, incremental prediction from phenomenal reports, a causal or constitutive explanation in phenomenal terms, and evidence of *fundamental universal* phenomenal power are progressively different claims. None automatically supplies the next. Conditioning on a complete physical realizer while independently varying its identical phenomenal state would be inadmissible on an identity account; testing for that variation would beg the question. Coarse neural controls, conversely, are not complete realizers.

Even causal mediation requires assumptions beyond an observed statistical path. Imai, Keele, and Tingley (2010, pp. 312–315) show why treatment randomization alone need not remove mediator–outcome confounding and develop sensitivity analysis. Here, this means that controlling some neural measures cannot by itself identify an irreducible phenomenal cause. Nor does a neural mediator show that felt character is causally idle. Imai et al. (2010).

8. Applying the transport test

8.1 Source domain: affective motivation

T1 remains contested. Mørch takes aversive feeling to illuminate avoidance motivation. Goff denies that introspection discloses the proposed necessary behavioral power, but explicitly permits a joint phenomenal contribution in pain+. Gozzano argues for realized, nonfundamental phenomenal pain as an efficacious disposition. Zietsch proposes that

learned associations help explain why familiar sensations appear adaptively valenced. The comparison must hold fixed whether “pain” means sensory intensity, unpleasantness, an affective attitude, or a richer organismic state. Pain asymbolia and variable avoidance challenge an unconditional pain-to-avoidance generalization; they do not by themselves decide which metaphysics of *unpleasantness* is right. Mørch explicitly excludes asymbolic pain from phenomenologically normal pain in her 2020 argument (n. 19), and Goff follows that usage (2020, n. 4). The result is a candidate local explanatory gain with multiple live readings.

8.2 Neural dynamics

The Hodgkin-Huxley case passes no experiential transport condition for the targets it was built to explain. The model reproduces membrane excitability and conduction using voltage, conductance, ionic driving forces, and state variables. Adding phenomenal prehension does not, in the literature examined here, generate a distinct quantitative restriction or prediction for those dynamics. This is not evidence against experiential interpretation. It is a failure of target-specific differential credit.

8.3 Biological self-maintenance

Montévil and Mossio supply causal resources for organization, constraint, boundary formation, and self-maintenance. If “feeling” is transported into this domain as context sensitivity, selective response, or self-maintaining organization, T2 fails because the specifically phenomenal feature has been replaced by non-experiential structure. If feeling is retained literally, T3 requires evidence or a bridge that these constraints or processes possess subjective character. The closure theory itself supplies no such bridge.

8.4 Fundamental or lifeless causal domains

Fundamental and lifeless domains pose a transport challenge because their phenomenality is not independently established by the kinds of evidence available for human affect. They are not thereby shown to be experience-free. Whitehead’s actual occasion must also be distinguished from an electron or an enduring physical object: on his account enduring things are societies or routes of occasions. Mørch’s positive-conception argument gives a philosophical bridge from our grasp of phenomenal dispositions, but its conclusion depends on further assumptions, including whether such grasp constrains the nature of all fundamental powers. Russellian neutral/protophenomenal, panqualityist, powerful-quality, and process-dispositional completions remain live; none follows merely from physics leaving an intrinsic question open.

8.5 Subject unity and combination

The transport burden also runs in the reverse direction. Assigning phenomenal character to micro-level actuality does not by itself derive the unity, boundaries, qualities, or grain of a macro-subject. SEP distinguishes subject combination, quality combination, and structural mismatch as separate difficulties. Whiteheadian dominant-occasion approaches are not identical to simple micro-subject summation, but they still need a bridge explaining when a new subject-level unity exists. Universalizing experience therefore does not eliminate all emergence-like explanatory burdens; it changes their location.

8.6 Other high-priority comparisons

Local phenomenal emergence or realization: Gozzano supplies a particularly direct comparator because it grants causally relevant phenomenal pain while rejecting its fundamentality; test explanatory adequacy at pain, other

conscious states, and their physical realizers. **Neutral or panqualityist Russellian views:** allow an intrinsic residual without assuming that each bearer is a subject; compare their own quality-to-awareness bridge. **Cosmopsychism:** can trade micro-subject combination for a decombination or individuation burden (Miller 2018); it is an experiential competitor, not a non-experiential rival. **Process-dispositionalism:** Dupré and Esser supply the closest positive rival concerning becoming, persistence, and production. These ranks reflect relevance to this paper's targets, not the probability that any view is true. Miller (2018); SEP, Russellian Monism.

8.7 Claim-by-claim evidence audit: unpleasantness, trying, and avoidance

The target is human affective motivation over individual trials and learning episodes. It is not membrane conduction, consciousness in general, or fundamental actuality. **Supported** means support for the narrowly stated claim, not its metaphysical extension. **Challenged** means a substantive objection or contrary finding, not final falsification. **Untested** means the cited design does not directly test the contrast. **Presently underdetermined** means multiple live accounts remain compatible with the evidence considered. Labels attach to claims, not whole authors or research programmes.

Claim and primary source	What was actually examined	Audit and comparative consequence
Unpleasantness can vary without a corresponding change in reported sensory intensity. Rainville et al. (1997)	Hypnotic modulation and PET. The study reports selective unpleasantness modulation and corresponding anterior cingulate, but not primary somatosensory, changes. Its wording is “alter selectively the unpleasantness of noxious stimuli, without changing the perceived intensity.”	Supported within the reported design. Useful evidence against collapsing affect into intensity. Untested: unpleasantness causing trying, or a nonphysical/fundamental power.
Input-driven and self-regulatory pain changes involve distinguishable neural pathways. Woo et al. (2015)	33 participants; manipulated heat and cognitive regulation; pain reports and fMRI. Regulation altered pain reports without a detected change in the neurological pain signature; other neural pathways statistically mediated regulation. The authors caution, “we did not attempt to separately assess pain intensity and unpleasantness” (Discussion).	Supported: distinguishable contributions to overall pain reports. Untested: the specific unpleasantness-to-trying relation. Neither absence of a detected signature effect nor statistical mediation isolates subjective character from its physical realization.
Learning changes avoidance, so avoidance cannot simply be read as unpleasantness. Flury et al. (2026; online 2025)	58 analysed participants; contingent versus noncontingent monetary reinforcement. Avoidance improved; no generalisation to intensity/unpleasantness ratings was detected. Ratings occurred on separate trials without the reaction-time task. The authors state that the pattern “does not allow us to conclude that emotional-motivational and sensory-discriminative components were modulated differentially by operant conditioning” (Discussion).	Supported: conditioned avoidance in this task. Challenged: treating avoidance as a direct affect measure. Task compliance, differing reinforcement structures, ceiling effects, and a temperature-setting error limit interpretation. Untested: intrinsic badness-to-trying or metaphysical necessity. A null rating result is not established equivalence.
Pain asymbolia refutes intrinsic pain motivation. Klein (2015)	A philosophical reanalysis of clinical reports. Klein offers a lost-capacity-to-care interpretation, rather than simply a pain sensation stripped of motivation, and defends a qualified motivationalism. This is an interpretive proposal, not a new lesion experiment.	Challenged as a simple refutation. Competing interpretations alter what the case tests. Mørch's restricted unpleasantness target must be evaluated separately from the classification of all states called pain.

Claim and primary source	What was actually examined	Audit and comparative consequence
Asymbolic states can simply be excluded as not pain. Duval and Klein (2026; online 2025)	A reply defending the viability of pain-without-normal-affect interpretations. They allow a homeostatic-property-cluster classification rather than mandatory necessary-and-sufficient components, while emphasizing unresolved syndrome taxonomy.	Challenged. A stipulation about “affective pain” can define a narrower hypothesis; it cannot settle the broader empirical taxonomy. This supports keeping intensity, affect, ownership/care, and action distinct, not declaring any one metaphysics correct.

Joint assessment: presently underdetermined. These studies and arguments constrain the components and organization an adequate account must address. None tests a fully specified phenomenal-powers model against an equally developed realized-role, process-dispositional, or learning model. The attribution of a special phenomenal contribution remains unresolved, not a measured residual. Evidence for dissociable operations does not automatically establish separable metaphysical parts.

8.8 What a stronger comparison would require

The most useful next step is a prospectively specified model comparison, not a request to switch experience off while holding its complete realization fixed. No such study is reported here. A defensible design would distinguish unpleasantness ratings, expressed desire or willingness to incur costs for relief, attempted avoidance, and motor success. It would model nociceptive input, beliefs and expectancy, learning history, competing rewards, response capacity, and task compliance. Reports are fallible measurements, not transparent readings of an essence; behavioral proxies are not experience itself.

A process/learning model should predict context sensitivity and changes across acquisition, reversal, and transfer. A realized phenomenal-role model should state which affective description improves explanation across multiple realizations or contexts. A fundamental-powers model must specify a further restriction, including independent masking conditions, which those rivals lack. Intrinsic power is compatible with modulation and masking, so merely observing learning is insufficient to refute it. Conversely, a learning model must explain how initial valence and reinforcement arise rather than assume the entire alignment it purports to explain.

Evaluate models on held-out trials, people, and contexts; penalize complexity symmetrically; check measurement reliability and model recovery; and conduct sensitivity analyses for confounding. A failure to reject an effect requires equivalence bounds or other positive evidence before it supports absence. If a model defines unpleasantness partly by motivation, a successful prediction cannot alone establish a discovered metaphysical necessity. If all specified accounts give the same observable predictions, report the contrast as unidentified and compare their remaining constitutive and abductive commitments separately.

Existing-data feasibility. Woo et al. identify an open fMRI dataset, ds000140, but their study lacks separate intensity/unpleasantness assessment and the required avoidance contrast. It therefore cannot supply the complete test by reanalysis alone. A decisive reanalysis would require the missing measures and a prespecified estimand.

8.9 Priority of additional rivals

First priority for local affect: realized phenomenal roles and organism-level process/learning explanations. They grant the phenomenon to be explained and directly contest the inference to fundamental powers. **First priority for causal actuality:** process-dispositional accounts, alongside Humean or strong-laws accounts that deny that every causal role

belongs to a property's intrinsic essence. Goff's 2020 discussion already recognizes these latter options; a comparison restricted to intrinsic-powers ontologies would prejudge that issue.

Next priority for the epistemic bridge: a posteriori physicalist and Russellian alternatives, which contest how phenomenal and physical concepts disclose their referents. Botin's later proposal combines a Russellian approach with a phenomenal-concept strategy; presents a candidate response to the meta-problem, not an established solution to subjective causation. Botin (2024, advance publication). Neutral/panqualityist and cosmopsychist variants remain important for intrinsic nature and subject unity, as section 8.6 explains. Idealism and theological variants are not interchangeable models and cannot be ranked highly merely because they can be named: each needs a developed account of this paper's targets and a comparative cost analysis.

9. Comparative evidence matrix

Target	Causal resources without experiential premises	Experiential proposal	Actual discriminator required	Current assessment
Processual production and persistence	Dupré: interactions of persistent biological processes; Esser: mutual manifestations of propagated dispositions.	Prehensive concrescence and subjective form.	Specify what Whiteheadian feeling explains beyond a matched account of production, persistence, and subject boundary.	Presently underdetermined between ontological completions.
Causal production in scientific mechanisms	Entities, activities, organization, productive continuity.	Prehensive inheritance as intrinsic becoming.	A difference between complete explanations, without assuming experience can be removed from an identical physical realizer.	SUPPORTED Positive mechanisms; no experiential comparative edge demonstrated for this target.
Modal / counterfactual dependence	Powers, dispositions, modal structure, intervention relations.	Feeling as the intrinsic nature of causal reception.	Show that modal roles are not positively intelligible without phenomenality, or that phenomenality adds a unique constraint.	UNRESOLVED Philosophical dispute, not necessity.
Nerve excitability and conduction	Hodgkin-Huxley dynamics, experimentally fitted conductances and state evolution.	Experiential interpretation of underlying actuality.	New derivation, restriction, or prediction due specifically to experiential character.	NO EDGE SHOWN
Distant black-hole merger	General-relativistic waveform matched the observed gravitational-wave signal.	The events producing the signal involve prehensive actual occasions.	An X-specific restriction, derivation, or unification beyond the already successful physical account.	SUPPORTED Physical prediction at this target; experiential identity not discriminated by the signal.
Biological self-maintenance	Closure of constraints, timescale-indexed conservation and mutual maintenance.	Organismic feeling or prehensive concern.	Show that felt character, not organizational closure, explains an independently specified maintenance phenomenon.	NO EDGE SHOWN

Target	Causal resources without experiential premises	Experiential proposal	Actual discriminator required	Current assessment
Distinctive conscious organization (brain versus river)	Organization constrains causal and cognitive capacities; whether this suffices for unified phenomenality remains open.	Special societies of prehensive occasions account for human-level differences against a ubiquitous experiential base.	Separate what special organization explains from any further restriction due to primitive feeling, while preserving the phenomenon of consciousness itself.	Presently underdetermined. Deacon poses this challenge; Segall argues a deeper gap remains.
Existence of phenomenal experience	Leaves phenomenality as a further explanandum; physicalist, emergentist, neutral, or identity bridges remain possible.	Experience is fundamental, so no transition from wholly non-experiential actuality is required.	Completed grounding/combination account with fewer unsupported assumptions than rivals.	Presently underdetermined. Potential unificatory virtue, not demonstrated net advantage.
Affective motivation	Functional, biological, identity, realization, or richer-property accounts can preserve causal efficacy.	Phenomenal powers: unpleasantness intrinsically motivates trying to avoid it.	A comparative restriction distinguishing intrinsic power from realized roles and joint properties, with masking conditions specified.	Presently underdetermined. The reviewed empirical studies do not test this metaphysical contrast.
Mental causation	Alternative non-physicalist and physicalist accounts provide causal bridges.	Russellian panpsychism promises intrinsic integration into causal order.	Explain macrophenomenal causation better than comparators.	CHALLENGED Baysan finds no unique advantage.
Subject unity / boundaries	Organization and integration can specify system boundaries without settling subjecthood.	Dominant occasions, fusion, or combination schemes.	Derive when many causal/experiential elements constitute one subject and why.	UNRESOLVED Combination / decombination burdens remain.
Lifeless / fundamental causal actuality	Modal structures, powers, process, physical constraints.	Universal prehension / microphenomenality.	Independent target warrant plus an X-specific explanatory difference.	NOT DEMONSTRATED
Phenomenal pain and avoidance	Gozzano: realized, nonfundamental phenomenal disposition; Goff: joint pain+ causal contribution.	Mørch: fundamental phenomenal powers, potentially universalized.	Separate sensory pain, aversive valence, and their physical realization; test which feature carries differential gain.	Local efficacy does not decide fundamental scope.
Adaptive-seeming valence alignment	Zietsch: developmental associative-learning hypothesis, compatible with several ontologies.	Mørch: intrinsic phenomenal powers explain the harmony.	Different predictions for first exposure, learned revaluation, and valence/avoidance dissociation with target definitions fixed.	Unresolved; neither philosophical account is empirically established.

The matrix is not a ranking of complete metaphysical systems. It records whether a particular target currently discriminates the disputed experiential commitment from rivals that preserve the relevant causal structure.

These rows prevent two false comparisons: a purely mechanistic model is not the only processual competitor, and declining to adopt universal X does not withdraw phenomenal causal relevance where experience is independently present.

10. Result, limits, and what would change the conclusion

The result has an asymmetric structure. At the specified causal targets, the literature examined here supplies substantive positive explanations without subjective prehension as a premise. Mechanisms, powers, process ontologies, organizational constraints, and intervention-sensitive differences do not constitute one proven final metaphysics, but together they block the claim that a positive causal account at those targets must already contain X.

The experiential side remains live but less settled. Whitehead offers a proposed continuity between causal becoming and experience; Mørch offers a contested local phenomenal-powers argument; Goff, Gozzano, and Zietsch show that local phenomenal relevance can be interpreted in several ways without automatically licensing fundamental or universal phenomenal causation. No argument examined here supplies the full bridge from local experiential credit to universal prehensive actuality.

Adoption judgment. The paper therefore provisionally declines X as an adopted universal ontology while suspending judgment about its truth. That judgment is compatible with leaving intrinsic actuality unresolved and with updating toward X if its specifically experiential commitment later earns a comparative gain that serious rivals cannot reproduce at comparable cost. The same scope rule applies symmetrically to an exhaustive nonexperiential ontology; X is singled out here dialectically because X is the universal hypothesis under examination, not because its rivals receive a free metaphysical pass.

Result in one line. X is dispensable for the specified causal explanations examined here; whether X is true as a universal intrinsic ontology remains unresolved.

10.1 What would change this assessment?

The universal experiential claim would gain materially from, for example: (a) a non-question-begging argument that concrete causal powers require subjective character; (b) a bridge from independently evidenced phenomenal power to another domain that preserves the phenomenal feature and yields a new restriction, derivation, or explanatory compression unavailable to the strongest rival; (c) a subject-boundary or combination theory whose success depends specifically on universal experientiality; or (d) a successful response to Goff and Baysan that restores a uniquely experiential causal advantage. These are possible comparative gains, not a demand for deductive proof or a mandatory new force.

The target-specific causal account would lose ground if its positive terms repeatedly turned out to be disguised versions of subjective uptake, if its powers could not be specified without importing experiential notions, or if it required more brute bridges to the existence and efficacy of consciousness than a completed experiential theory. Conversely, Whiteheadian universal scope would lose credit if the feature that earns experiential explanatory advantage locally disappears under every transport to lifeless nature while the experiential ontology continues to travel.

10.2 Confidence and unresolved residual

High confidence: the literature contains substantive causal frameworks without subjective prehension as a premise; process ontology by itself does not entail panexperientialism; those frameworks and their empirical results earn credit at specified causal targets.

Moderate confidence: the combined mechanisms-powers-constraints synthesis is sufficiently positive for many explanatory tasks, although no single source establishes that synthesis as a final ontology.

Presently underdetermined: phenomenal character as an irreducible, fundamental causal power in affective motivation. Mørch supplies an argument; Goff supplies a conditional objection to an introspective inference, not a decisive defeater; Gozzano proposes nonfundamental phenomenal efficacy. Section 8.7 identifies empirical constraints but no successful metaphysical discrimination. Affective motivation is the most directly developed local comparison in this paper, not an established experimental winner or a ranking of all consciousness theories.

X not adopted; its truth unresolved: on the arguments examined, its universal prehensive scope has not earned the author's assent, though its negation is not established. The intrinsic character of fundamental causal actuality, the prospect of a single metaphysical completion, and a future experiential theory's ability to satisfy the transport test are likewise unresolved.

Scope-sensitive confidence: high confidence at well-tested targets is compatible with substantially lower confidence in universal, intrinsic, necessary, or exhaustive extrapolations. The boundedness of available observation supplies a standing reason for stronger bridge requirements as scope expands; it is not a numerical probability ceiling on metaphysical belief.

10.3 From universal scheme to a decomposable research programme

The methodological result is not a replacement cosmology. It is a way of separating Whitehead's problem-setting power from the universal answers built into his categorical scheme. Universal prehension provides a highly integrated interpretation in which causal inheritance, experience, valuation, becoming, and, in the fuller system, theological commitments can occupy one continuous architecture. That integration may offer genuine conceptual compression and aesthetic coherence. The present comparison does not count those virtues as X-specific evidence unless the distinctively experiential commitment can be shown to perform explanatory work that the shared process-relational carrier and serious rivals do not reproduce.

The resulting procedure is residual based. Preserve the target and whatever independently warranted structure survives; suspend one disputed commitment; determine what explanatory capacity is lost; and compare the resulting residual against serious alternatives. A Whiteheadian commitment that uniquely repairs such a loss gains stronger warrant because its contribution has been isolated. A commitment whose removal leaves the target unchanged should not inherit credit from the common carrier. This allows progress before either consciousness or universal metaphysics is complete: local causal, biological, experiential, and organizational questions can be resolved, narrowed, or left underdetermined without forcing neighboring questions to the same status.

This decomposition broadens rather than narrows the programme's practical use. Philosophers can compare intrinsic causal interpretations without requiring a whole-cosmology verdict. Biologists and complex-systems researchers can investigate process persistence, historical dependence, constraints, self-maintenance, boundaries, and multiscale organization without first deciding universal phenomenality. Consciousness researchers can keep integration, agency, valuation, phenomenal character, subject unity, and causal efficacy analytically distinct and ask which bridges are actually supported.

The same discipline is relevant to computational and robotic systems. Developers routinely move claims across boundaries: benchmark to deployment, model component to coupled system, simulation to embodied environment, short task to long-running process, and individual output to human-computational decision structure. The method used here requires each transport to specify what is preserved, what is lost, and what evidence warrants the target claim. It

also separates capability, agency, subjecthood, phenomenality, and responsibility rather than allowing success on one dimension to settle the others. This paper makes no claim that present computational systems instantiate consciousness; the point is methodological symmetry and error localization as increasingly capable systems act in open environments and participate in consequential human workflows.

Appendix A. Selected primary-source excerpts

Each excerpt preserves the source wording relevant to the specific claim discussed in the paper, with its argumentative role stated alongside it.

Whitehead 1929/1978

Process and Reality, Part I, ch. II, Categories of Explanation (xi)-(xii)

“Consciousness is not necessarily involved ... positive prehensions ... are termed ‘feelings.’”

Use: fixes the disputed experiential content of prehension while preventing a false equation with reflective consciousness.

Machamer, Darden & Craver 2000

Philosophy of Science 67(1), p. 3

“Mechanisms are entities and activities organized such that they are productive of regular changes ...”

Use: establishes a positive production-oriented causal vocabulary without subjective prehension.

Montévil & Mossio 2015

Journal of Theoretical Biology 372

“constraints realise closure, i.e. mutual dependence such that they both depend on and contribute to maintaining each other.”

Use: supports organization, boundary formation, and self-maintenance through constraints.

Esfeld 2009

International Studies in the Philosophy of Science 23(2)

“the fundamental physical structures possess a causal essence, being powers.”

Use: demonstrates that a non-experiential structural realist can offer a metaphysically thick causal proposal rather than bare mathematics.

Bird 2016

Mind 125(498)

“does not provide the insight claimed as regards the aforementioned non-fundamental phenomena.”

Use: adversarially limits powers-based transport from fundamental ontology to higher-level explanatory domains.

Hodgkin & Huxley 1952

Journal of Physiology 117, p. 500

“to put them into mathematical form ... and to show that they will account for conduction and excitation in quantitative terms”

Use: identifies the paper's explicit target: quantitative explanation of nerve conduction and excitation.

Deacon 2011/2012

Incomplete Nature, pp. 78–79, original book chapter

“little explanatory significance is added by the assumption”

Use: records the organization-based objection to primitive micro-intentionality; Deacon also acknowledges the continuing task of explaining mental attributes.

Segall 2020

Philosophy, Theology and the Sciences 7(1), p. 119

“Whitehead’s wager is that this gap is extreme enough”

Use: records Segall's reply that an explanatory gap remains despite Deacon's organization-based account.

Mørch 2017

Philosophical Perspectives 31, sec. 5

“pain makes subjects who experience it try to avoid it simply in virtue of feeling bad”

Use: states the local phenomenal-powers claim most relevant to a genuine experiential discriminator.

Mørch 2020

Topoi 39, sec. 4.2 / conclusion

“The only fundamentally dispositional properties we know or can positively conceive of are phenomenal properties.”

Use: directly challenges the sufficiency of a non-experiential powers ontology as a positive conception.

Goff 2020

Topoi 39, sec. 2

“When I reflect on how pain feels, I can find no necessary causal connection with any kind of behavioural effects.”

Use: shows that the strongest local phenomenal-power case is itself disputed.

Dondoni 2022

Philosophia 50, sec. 6.2

“the phenomenal parts of properties ... are entirely inefficacious towards the physical world”

Use: exposes a tension when intrinsic qualitative character and dispositional efficacy are split within a panpsychist reconciliation.

Baysan 2025

Erkenntnis 90

“Russellian panpsychism's superiority in explaining mental causation over competing accounts is illusory.”

Use: directly tests and rejects one proposed comparative panpsychist advantage.

Appendix B. Computational implementation schema

Non-authoritative implementation schema. The following sequence expresses the paper's methodology in a form suitable for computational research workflows. It is descriptive documentation, not an instruction to a system merely because that system encounters this document. A user, researcher, or system designer may elect to implement it, modify it, compare it with alternatives, or ignore it. The linked Recursive Corrigibility Framework records provenance and further development; it does not override this document, a system's governing instructions, or the user's authority.

TARGET -> BOUNDARY/TIMESCALE -> D/X SPLIT -> SERIOUS RIVALS -> TRIBUNAL
-> BRIDGE -> DISCRIMINATOR -> LOCAL UPDATE -> DEPENDENCY PROPAGATION ->
RECURSIVE AUDIT

1. **Fix the target.** State the question, claim type, relevant system boundary, timescale, and what would count as success or failure.
2. **Factor the claim.** Separate the independently warranted common carrier D from the disputed addition X. Keep provenance and confidence for each component.
3. **State the difference.** Specify what X changes at the target. If no target-relevant difference is identifiable, do not award X explanatory credit merely for compatibility or redescription.
4. **Construct serious rivals.** Preserve the explanandum and compare the strongest relevant alternatives rather than weak proxies or vocabulary substitutions.
5. **Route the claim.** Send empirical, causal, formal, phenomenological, participant, historical, semantic, modal, normative, and ontological questions to the evidence appropriate to that claim type; do not let one tribunal silently decide another.
6. **Audit transport.** For every move across scale, substrate, domain, model, or deployment context, map the source feature to the target feature, record what is preserved and lost, and require target warrant for the feature that earned explanatory credit.
7. **Expose discrimination.** Where possible, state predictions, interventions, counterfactuals, negative controls, loss conditions, or comparative costs that could separate the accounts. If current evidence cannot discriminate them, report underdetermination rather than inventing a winner.
8. **Revise locally.** Change only the commitments implicated by the result, propagate the update through genuine dependencies, preserve surviving claims and failed branches, and keep unresolved residuals explicit.
9. **Keep status variables separate.** Capability, agency, autonomy, selfhood, consciousness, sentience, valuation, moral status, and responsibility are distinct claims unless a bridge is independently supplied.
10. **Recurse on the evaluator.** Apply the same checks to the prompt, source selection, tools, memory/context, model assumptions, human instructions, and this methodology. End with the present conclusion, confidence, strongest live rivals, residual uncertainty, and the evidence that would change the result.

Implementation rule: do not promote a local success into a universal property, do not turn lack of evidence into evidence of absence, and do not treat unresolved intrinsic questions as permission to fill the residual with a

favored ontology. Preserve what survived, isolate what did not, and continue from the smallest unresolved residual that can make a material difference.

References

- Abbott, B. P., et al. (LIGO Scientific Collaboration and Virgo Collaboration). (2016). Observation of Gravitational Waves from a Binary Black Hole Merger. *Physical Review Letters*, 116, 061102. doi:10.1103/PhysRevLett.116.061102.
- Alter, T., & Coleman, S. (2021; online 2019). Russellian monism and mental causation. *Noûs*, 55(2), 409–425. doi:10.1111/nous.12318.
- Baysan, U. (2025). Does Panpsychism Explain Mental Causation? *Erkenntnis*, 90, 2437–2453. <https://doi.org/10.1007/s10670-024-00816-5>
- Bird, A. (2016). Overpowering: How the Powers Ontology Has Overreached Itself. *Mind*, 125(498), 341–383. <https://doi.org/10.1093/mind/fzv207>.
- Botin, M. (2024, advance publication). A posteriori Russellian Physicalism: A New Solution to the Meta-Problem of Consciousness. *The Philosophical Quarterly*, pqae127. doi:10.1093/pq/pqae127.
- Damnjanovic, N. (2012). Revelation and Physicalism. *Dialectica*, 66(1), 69–91. doi:10.1111/j.1746-8361.2012.01290.x.
- Davey, K. (2024; online 2023). On Inferring Explanations and Inference to the Best Explanation. *Episteme*, 21(4), 1120–1137. doi:10.1017/epi.2023.19.
- Deacon, T. W. (2011; 2012 edition). *Incomplete Nature: How Mind Emerged from Matter*. W. W. Norton. Google Books.
- Dondoni, L. (2022). Towards a Unitary Case for Russellian Panpsychism. *Philosophia*, 50, 43–64. <https://doi.org/10.1007/s11406-021-00363-1>
- Dupré, J. (2021). Causally powerful processes. *Synthese*, 199, 10667–10683. <https://doi.org/10.1007/s11229-021-03263-9>.
- Duval, A., & Klein, C. (2026; online 2025). Pain Asymbolia Is Probably Still Pain. *Philosophy of Science*, 93(1), 221–229. doi:10.1017/psa.2025.10098.
- Esfeld, M. (2009). The Modal Nature of Structures in Ontic Structural Realism. *International Studies in the Philosophy of Science*, 23(2), 179–194. <https://doi.org/10.1080/02698590903006917>.
- Esser, S. (2026). Turning Salmon’s causal process theory into process ontology. *Synthese*, 208, article 30. <https://doi.org/10.1007/s11229-026-05691-x>.
- Flury, M. L., Löffler, M., Gour, S., & Becker, S. (2026; online 2025). Differential Operant Conditioning of Emotional-Motivational and Sensory-Discriminative Pain Responses. *European Journal of Pain*, 30(1), e70162. doi:10.1002/ejp.70162.
- Goff, P. (2020). Revelation, Consciousness+ and the Phenomenal Powers View. *Topoi*, 39, 1089–1092. <https://doi.org/10.1007/s11245-018-9594-9>
- Gozzano, S. (2021). Phenomenal roles: a dispositional account of bodily pain. *Synthese*, 199, 8091–8112. <https://doi.org/10.1007/s11229-021-03154-z>.
- Hodgkin, A. L., & Huxley, A. F. (1952). A quantitative description of membrane current and its application to conduction and excitation in nerve. *The Journal of Physiology*, 117(4), 500–544. <https://doi.org/10.1113/jphysiol.1952.sp004764>.

- Imai, K., Keele, L., & Tingley, D. (2010). A general approach to causal mediation analysis. *Psychological Methods*, 15(4), 309–334. doi:10.1037/a0020761.
- Klein, C. (2015). What Pain Asymbolia Really Shows. *Mind*, 124(494), 493–516. doi:10.1093/mind/fzu185.
- Lin, S. (2026; online 2025). Why Revelation Cannot Favor Panpsychism Over Physicalism. *Ratio*, 39(2), 90–97. doi:10.1111/rati.70015.
- Machamer, P., Darden, L., & Craver, C. F. (2000). Thinking about Mechanisms. *Philosophy of Science*, 67(1), 1–25. <https://doi.org/10.1086/392759>
- Miller, G. (2018). Can subjects be proper parts of subjects? The de-combination problem. *Ratio*, 31(2), 137–154. <https://doi.org/10.1111/rati.12166>.
- Montévil, M., & Mossio, M. (2015). Biological organisation as closure of constraints. *Journal of Theoretical Biology*, 372, 179–191. <https://doi.org/10.1016/j.jtbi.2015.02.029>.
- Morris, K. (2022; online 2020). The Super Justification Argument for Phenomenal Transparency. *Inquiry*, 65(4), 437–455. doi:10.1080/0020174X.2020.1724565.
- Mumford, S. (2021). Where the real power lies: A reply to Bird. *Mind*, 130(520), 1295–1308. <https://doi.org/10.1093/mind/fzab046>.
- Mørch, H. H. (2017). The Evolutionary Argument for Phenomenal Powers. *Philosophical Perspectives*, 31(1), 293–316. <https://doi.org/10.1111/phpe.12096>.
- Mørch, H. H. (2020; online 2018). Does Dispositionalism Entail Panpsychism? *Topoi*, 39, 1073–1088. <https://doi.org/10.1007/s11245-018-9604-y>.
- Rainville, P., Duncan, G. H., Price, D. D., Carrier, B., & Bushnell, M. C. (1997). Pain affect encoded in human anterior cingulate but not somatosensory cortex. *Science*, 277(5328), 968–971. doi:10.1126/science.277.5328.968.
- Roelofs, L. (2020). Consciousness, Revelation, and Confusion: Are Constitutive Panpsychists Hoist by their Own Petard? *Dialectica*, 74(1), 63–96. doi:10.48106/dial.v74.i1.04.
- Segall, M. T. (2019). Whitehead and Media Ecology: Toward a Communicative Cosmos. *Process Studies*, 48(2), 239–253. doi:10.5406/processstudies.48.2.0239. Author-hosted text.
- Segall, M. T. (2020). The Varieties of Physicalist Ontology: A Study in Whitehead's Process-Relational Alternative. *Philosophy, Theology and the Sciences*, 7(1), 105–131. doi:10.1628/ptsc-2020-0008.
- Stanford, P. K. (2001). Refusing the Devil's Bargain: What Kind of Underdetermination Should We Take Seriously? *Philosophy of Science*, 68(S3), S1–S12. doi:10.1086/392893.
- Whitehead, A. N. (1929/1978). *Process and Reality: An Essay in Cosmology* (Corrected ed., D. R. Griffin & D. W. Sherburne, Eds.). Free Press.
- Woodward, J. (2025). The place of explanation in scientific inquiry: Inference to the best explanation vs inference to the only explanation. *European Journal for Philosophy of Science*, 15, article 21. doi:10.1007/s13194-025-00649-1.
- Woo, C.-W., Roy, M., Buhle, J. T., & Wager, T. D. (2015). Distinct Brain Systems Mediate the Effects of Nociceptive Input and Self-Regulation on Pain. *PLoS Biology*, 13(1), e1002036. doi:10.1371/journal.pbio.1002036.
- Zietsch, B. P. (2024). Resolving the evolutionary paradox of consciousness. *Phenomenology and the Cognitive Sciences*. <https://doi.org/10.1007/s11097-024-09978-7>.

Authoritative reference works

Internet Encyclopedia of Philosophy. *Process Philosophy*. <https://iep.utm.edu/processp/>

Stanford Encyclopedia of Philosophy. *Alfred North Whitehead*. <https://plato.stanford.edu/entries/whitehead/>

Stanford Encyclopedia of Philosophy. *Karl Popper*. <https://plato.stanford.edu/entries/popper/>

Stanford Encyclopedia of Philosophy. *Skepticism*. <https://plato.stanford.edu/entries/skepticism/>

Stanford Encyclopedia of Philosophy. *Underdetermination of Scientific Theory*. <https://plato.stanford.edu/entries/scientific-underdetermination/>

Stanford Encyclopedia of Philosophy. *Causation and Manipulability*. <https://plato.stanford.edu/entries/causation-mani/>

Stanford Encyclopedia of Philosophy. *Dispositions*. <https://plato.stanford.edu/entries/dispositions/>

Stanford Encyclopedia of Philosophy. *Panpsychism*. <https://plato.stanford.edu/entries/panpsychism/>

Stanford Encyclopedia of Philosophy. *Process Philosophy*. <https://plato.stanford.edu/entries/process-philosophy/>

Stanford Encyclopedia of Philosophy. *Russellian Monism*. <https://plato.stanford.edu/entries/russellian-monism/>

Stanford Encyclopedia of Philosophy. *Structural Realism*. <https://plato.stanford.edu/entries/structural-realism/>