

The Hierarchy of Relational Claims in the Literature: A Situated Review

Framework originated by Jim Grusendorf. Literature review by Claude (Anthropic) and ChatGPT (OpenAI).

I. Scope and Purpose

This review situates Jim Grusendorf's Hierarchy of Relational Claims within the existing philosophical and cognitive-scientific literature on analogy, structural correspondence, and identity. Its purpose is not to evaluate the framework against an imagined standard of credentialed academic work, but to map it honestly: where it overlaps with existing contributions, where it independently converges on recognized moves, where it synthesizes across previously separate literatures, and where it introduces distinctions not found in the field.

One fact about the framework's origin bears stating plainly: it was developed independently of the literature reviewed here. Grusendorf was not building on Goodman, Gentner, or Bunge; he was reasoning from first principles about the structure of relational claims. This is not a minor biographical detail. Independent convergence on the same structural insight that the existing literature has reached — and in some cases, convergence beyond where that literature has gone — is evidence of exactly the kind of robustness the framework claims to provide. In science, independent convergence on a result strengthens rather than undermines confidence in it. The same logic applies here.

II. The Intellectual Landscape

The study of analogy, correspondence, and identity spans several distinct academic communities that have largely not spoken to each other. Situating the Hierarchy requires surveying at least four of them.

The cognitive science of analogy — Gentner's structure-mapping theory (1983) is the dominant account. Gentner distinguishes surface attribute matching from relational mapping and introduces the Systematicity Principle: analogies that place interconnected higher-order

relational structures in correspondence are stronger than those that map isolated features. Her computational implementation with Falkenhainer and Forbus (1989) operationalizes this as a constraint-satisfaction process. The systematicity framework is the closest established neighbor to the Hierarchy's lower correspondence tiers, and Gentner's emphasis on structural coherence rather than surface resemblance anticipates the Tier 1/Tier 2 distinction.

Thagard, Holyoak, and colleagues extend this tradition by treating analogical mapping as constraint satisfaction in a computational sense — constraints guiding retrieval and alignment. This captures something real about the cognitive process but should be distinguished from the Hierarchy's use of "constraint," which is nomological: the constraint space of the problem domain, not the selection process of the reasoner.

Mary Hesse's *Models and Analogies in Science* (1966) provides a third relevant framework. Hesse distinguishes positive analogy (the features source and target are known to share), negative analogy (features known to differ), and neutral analogy (features of the source whose presence or absence in the target is unknown). Her neutral analogy is the epistemic zone a model holds open for investigation — correspondences neither confirmed nor ruled out, which legitimate continued inquiry. This anticipates the Hierarchy's characterization of Tier 2's positive epistemic function: a well-formed structural mapping establishes that a solution exists within a shared constraint space, which defeats claims of incompatibility and licenses further investigation without asserting that any particular correspondence is constraint-derived. Hesse's framework remains at the level of scientific models of physical systems; the Hierarchy generalizes and formalizes this function as a named tier with explicit epistemic content.

Douglas Hofstadter occupies a different position in this landscape. In *Gödel, Escher, Bach* and more explicitly in "Analogy as the Core of Cognition" (2001), Hofstadter argues that analogy-making is not a specialized cognitive tool but the fundamental mechanism of all thought — that every act of categorization, recognition, or conceptual transfer is an analogical act. His insistence that there is no sharp line between analogy and identity — that recognizing a category instance is itself an analogical act, and that at high levels of abstraction analogical reasoning approaches identity — directly anticipates the Hierarchy's structural claim about the unified axis. Hofstadter opens the door; the Hierarchy builds the taxonomy behind it. Where Hofstadter is descriptive and cognitive — characterizing how the mind works — the Hierarchy is normative and epistemic: providing a principled instrument for evaluating whether a given relational claim is justified and at what level. These purposes are complementary, and Hofstadter's framework provides the cognitive grounding for why the Hierarchy's distinctions matter in practice.

The philosophy of similarity — Nelson Goodman's "Seven Strictures on Similarity" (1972) is the foundational critique. Goodman argued that unqualified similarity claims carry zero epistemic content because any two objects share infinitely many properties and differ in infinitely many others. Only a specified dimension of comparison rescues similarity from vacuity. The Hierarchy's Tier 1 — Correspondence of Impression — is precisely Goodman's target: a claim where no dimension of comparison has been specified. Goodman's critique explains why Tier 1 is the weakest form of relational claim rather than a degenerate case, and why the pressure upward toward Tier 2 is not aesthetic but epistemically necessary. The Hierarchy formalizes the error Goodman diagnosed.

The analogy-to-identity boundary — Several figures have noted that analogy and identity are not categorically distinct. Mario Bunge (1967) stated explicitly that analogy is not an equivalence relation except in the limit case of identity. Marcin Schroeder (2019) proposed formalizing analogy via a sequence of binary relations of increasing generality, beginning from identity and extending outward through equivalence to weaker similarity-like relations. Jan Woleński (2019) explicitly frames identity as a special case of analogy in a logical and semantic formalization. These are not obscure remarks; they represent a recognizable strand of thinking, particularly in formal and mathematical approaches to analogy.

The Hierarchy independently converges on the same structural insight: identity and correspondence belong on a single axis, with identity as the limiting case where correspondence tightens to the point that apparent multiplicity collapses. This convergence is evidence of robustness, not redundancy.

The philosophy of science and laws of nature — The Tier 2/Tier 3 distinction in the Hierarchy tracks closely a debate in philosophy of science between accidental generalizations and genuine laws of nature. Lewis, Tooley, and Armstrong each developed accounts of what distinguishes a law (which supports counterfactuals and is modally necessary) from a regularity that merely happens to hold. The tools that have proven most tractable in that debate — counterfactual testing, predictive specificity, independence of derivation — translate directly to the question of whether a structural convergence is constraint-governed or coincidental. The Hierarchy's Tier 3 criterion inherits both the unresolved tensions of this debate and its best available instruments.

Simon Conway Morris's work on convergent evolution (*Life's Solution*, 2003) makes the empirical case that biological convergence reflects genuine constraint spaces rather than coincidence. Multiple independent evolutionary lineages converging on camera-eye architecture is not a coincidence; it reflects the constraint space imposed on any system that

must focus variable-distance light onto a photosensitive surface. The Hierarchy's Tier 3 generalizes this insight from biology to all relational reasoning.

Imre Lakatos's methodology of scientific research programmes (1970) is also adjacent to the Hierarchy's falsifiability analysis, though not identical. Lakatos distinguished the hard core of a research programme — its unfalsifiable central commitments, shielded by methodological fiat — from the protective belt of auxiliary hypotheses, which are the appropriate targets of empirical challenge. The analogy to the Hierarchy is structural: the Hierarchy's Tier 3 modal claims function analogously to Lakatos's hard core in the sense that challenging a necessity claim requires engaging at the level of constraint, not at the level of observed correspondence. However, where Lakatos's hard core is unfalsifiable by convention (scientists agree to protect it), the Hierarchy's tier-indexed falsifiability is a function of the logical structure of the claim itself: a Tier 2 mapping is not in the domain of falsification because it does not assert necessity; a Tier 3 claim is falsifiable precisely because it does. The frameworks are structurally analogous but operationally distinct.

The analogy literature on representation and abstraction — Floridi's "method of levels of abstraction" provides philosophical grounding for the claim that the definitional level at which a Tier 4 claim operates is not arbitrary but constrained by the analysis itself. Analogy research on re-representation and encoding at the right level of abstraction supports the same point: what counts as the correct definition for a Tier 4 claim is not free choice but a methodologically controlled decision. Work on theorem-proving by analogy, including formal treatments of representation change during analogical reasoning, provides adjacent technical support for the Hierarchy's resolution-indexing at Tier 4 and its recursive application.

The type-token distinction — Peirce's type-token distinction (1906), elaborated across twentieth-century philosophy of language, logic, and metaphysics, provides the conceptual grounding for Tiers 4 and 5. The Hierarchy's Identity of Definition corresponds to type identity; Identity of Referent corresponds to token (numerical) identity. The Stanford Encyclopedia of Philosophy article by Bartha on analogical reasoning and the associated literature on types and tokens provide the relevant technical context.

III. What the Hierarchy Does Distinctively

1. A Unified Epistemic Axis

The Hierarchy's most structurally ambitious claim is that correspondence and identity belong on a single axis: not two separate inquiries but one inquiry at different levels of constraint tightening. The Hierarchy is an epistemic framework — it evaluates the strength of relational claims under stated constraints, not the furniture of reality — and on this epistemic axis, identity is the boundary condition where no degrees of freedom between two perceived things remain.

As noted above, this move has precedent. Bunge, Schroeder, and Woleński each gesture at the same unification. What the Hierarchy adds is architecture: a five-tier diagnostic instrument built on this insight rather than a remark about it. The prior art offers scattered observations; the Hierarchy offers a working taxonomy with explicit criteria, entailment structure, and diagnostic implications. The observation that identity is the limit case of analogy does not yield, by itself, a principled account of what distinguishes Tier 1 from Tier 2, or Tier 2 from Tier 3. The Hierarchy provides that account.

It is also worth noting that the existing prior art on unification tends toward the formal and mathematical (Schroeder's relational sequences), while the Hierarchy operates in the domain of practical epistemic evaluation. Schroeder works downward from identity to weaker relations; the Hierarchy works upward from impression to identity, asking at each step what the evidence justifies. The direction matters: the Hierarchy is a tool for evaluating claims bottom-up, not a formal structure to be traversed top-down.

The Tversky-style objection — that similarity is inherently multi-dimensional and non-metric — does not threaten the single-axis claim once its scope is understood. The Hierarchy's axis is not a claim about the psychology of similarity judgment; it is a normative epistemic ordering of justificatory strength under constraint-tightening. Human similarity perception may be multi-dimensional; the axis along which relational claims earn warrant is not.

2. The Tier 2 / Tier 3 Distinction: Modal Necessity as a Tier Boundary

The distinction between Tier 2 (Correspondence of Structure) and Tier 3 (Correspondence of Constraint) is the Hierarchy's most practically consequential refinement and its clearest contribution to the analogy literature.

Gentner's Systematicity Principle is the nearest established treatment: it favors analogies where mapped relations participate in interlocking higher-order relational systems. But systematicity is a measure of structural coherence, not of the source of that coherence. Two systems can exhibit high systematicity — a well-articulated relational mapping where higher-order relations constrain lower ones — because they share governing constraints (Tier 3), because one was designed to mirror the other, because both derive from a common template, or because the analyst selected mapping dimensions that happen to cohere. Gentner's framework does not distinguish these cases. The Hierarchy does.

Tier 3 makes a modal claim: at least one element of the structural mapping holds because any solution to this class of problem, under these constraints, must take this form. This is the difference between "these two systems happen to have the same topology" and "any solution in this problem class must have this topology." The convergence of camera eyes across independently evolved lineages — in vertebrates, cephalopods, and annelids — is Tier 3 precisely because the constraint space (focus variable-distance light, wide dynamic range, photosensitive surface) forces lens-and-aperture architecture as a solution class, not because the systems happen to share it.

Two specifications sharpen the Tier 3 criterion and distinguish it from naive interpretations of "constraint-forced convergence":

At least one mapping element must be constraint-derived, not all of them. A Tier 2 analysis may identify many structural correspondences, some coincidental, some designed, some constraint-governed. Tier 3 holds if even one is constraint-derived. This is a threshold condition, not a description of the typical case: multiple constraint-derived elements strengthen the claim considerably, since each additional element that must take the form it does narrows the space of possible explanations for the convergence. Others need not be constraint-derived, and their falsification costs nothing. Tier 2 analysis functions as a discovery process for Tier 3 candidates, not as a precondition whose totality must be validated.

The constraints need produce only a solution class, not a unique solution. Camera eyes, compound eyes, and pinhole arrangements all satisfy the optical constraint space. The presence of multiple convergent solutions is in fact stronger evidence of Tier 3 than a single one, since it demonstrates that the constraint space is being characterized rather than that a coincidence is being labeled. The Hierarchy claims that the observed solution is one consistent outcome of the constraint space — not that no other solution was possible.

No existing analogy taxonomy cleanly draws this boundary as a named tier. The ingredients exist — systematicity, constraint satisfaction, convergent evolution — but the explicit formalization of modal necessity as a tier-level distinction between accidental structure and constraint-governed convergence is the Hierarchy's addition.

A further refinement sharpens what Tier 3 requires: the discipline of distinguishing constraint-entailed correspondences from narrative ones. In a rich Tier 2 mapping, many structural parallels may be identified. Some will be genuinely derivable from the shared constraint space — elements that must take the form they do given the governing problem structure. Others will be incidental: true in both domains, coherent within the mapping, but not forced by any shared constraint. The test is: can this correspondence be derived from the constraints, or does it merely fit within them? Only constraint-derived elements carry Tier 3 weight. Narrative correspondences — however numerous and however satisfying — can be set aside without affecting the Tier 3 verdict; their absence would not defeat the claim. Their presence does not strengthen it beyond Tier 2.

Gentner's Systematicity Principle is the nearest antecedent: systematicity tracks whether mapped relations are interconnected by higher-order constraining relations. But systematicity is a measure of structural coherence in the mapping — it does not distinguish correspondences that follow from a shared constraint space from those that merely cohere within it. The Hierarchy's constraint-entailed/narrative distinction does. It is the difference between a mapping element that could be predicted from the constraints in advance and one that, once observed in both domains, can be retrospectively fit into the mapping without being derivable from it. High systematicity without constraint-entailment is Tier 2, however dense.

The Tier 2/Tier 3 boundary also has a direct implication for the practice of challenging relational claims — an implication not drawn in the existing literature. Falsifiability, in the Popperian sense, applies at Tier 3 and above. A Tier 3 claim makes a necessity assertion: at least one element of the correspondence must hold for any solution within this constraint space. That claim can be falsified — by demonstrating that the purported constraint is not governing, or that the supposedly necessary element does not hold in a domain where the constraint does. A Tier 2 mapping makes no such assertion: it demonstrates that structural coherence exists between two systems, which blocks premature negation but does not stake a necessity claim. Challenging a Tier 2 mapping by pointing out that the correspondence is not necessary is not falsification; it is confirmation that the mapping is Tier 2 and not Tier 3. The appropriate challenge to Tier 2 is specification — which elements are constraint-derived and which are narrative — not falsification. Many apparent truth-disputes about relational claims

are actually tier-disputes: an analyst challenging a claim for failing the wrong test.

2a. The Positive Epistemic Function of Tier 2

The Hierarchy's treatment of Tier 2 includes a positive epistemic function not recognized in the existing analogy literature: the role of structural mapping as suspension of negation.

A well-formed Tier 2 mapping demonstrates that structural coherence exists between two systems. This demonstration performs a distinct epistemic service short of asserting necessity: it blocks the claim that no coherent mapping is possible. If a skeptic contends that two domains are fundamentally incompatible — that their structures cannot be placed in non-trivial correspondence — a well-formed Tier 2 mapping directly refutes that contention. It establishes that a solution exists within the relevant constraint space. It does not establish that the correspondence is necessary, or that it is constraint-derived in the Tier 3 sense. But it defeats impossibility claims with logical force.

This function is irreducibly positive. Tier 2 is not merely a weak Tier 3 or a Tier 3 claim for which evidence is pending. It is a claim that something — coherent structural correspondence — obtains, and that claim does real epistemic work. The work it does is limited in a specific way: it cannot advance the claim's tier. Density of mapping, elegance of correspondence, and explanatory satisfaction all strengthen the grounds for Tier 2 but none of them, individually or collectively, constitute evidence of constraint-derivation. Tier 2 suspension of negation is therefore defensive (you cannot rule this out) and assistive (you do not have to disbelieve this), but it does not generate the modal force that Tier 3 requires.

Hesse's neutral analogy — the zone of unknown correspondences that a model holds open for investigation — is the closest precedent. Her neutral analogy licenses continued inquiry by suspending closure; the Hierarchy's Tier 2 suspends negation by demonstrating coherence. The epistemic move is similar in structure. But Hesse's framework applies to scientific models of physical systems where the neutral zone is eventually resolved by empirical test. The Hierarchy formalizes this function at the level of a named epistemic tier, characterizes precisely what it can and cannot do, and applies it across domains including those where empirical resolution is not available.

Regarding verification: whether a Tier 3 claim is warranted depends on the nature of the constraints. Logical or mathematical constraints may be established by derivation from the problem specification alone, warranting high or absolute confidence. Physical, biological, and cognitive constraints typically require empirical investigation to confirm that the constraint

space has been correctly characterized. The Hierarchy does not flatten this distinction; it is built into how Tier 3 claims are established, not into what they are.

3. Identity Tiers as Required Completion Tests

The Hierarchy's normative claim about the identity tiers is its most distinctive contribution and the one least anticipated by the existing literature.

The claim is not that identity obtains in most cases, or that analysis should aspire toward identity. The claim is that relational analysis is epistemically incomplete unless it has evaluated whether multiplicity collapses — whether the two perceived things are the same under a shared definition (Tier 4) or the same individual (Tier 5). If identity does not obtain under the operative constraints, Tier 3 is the correct and complete terminal verdict. Identity is not a prize withheld; it is a condition that either obtains or does not, and its non-obtaining is a legitimate and often expected result.

What is distinctive is the normative rule: evaluation cannot stop short of this test without being methodologically deficient — and not merely deficient in the sense of leaving work undone, but deficient in a more serious sense. If Tier 4 or Tier 5 actually obtains and analysis stops at Tier 3, the analyst has not merely been incomplete; they have mischaracterized the relationship. To describe two things as standing in correspondence when they are in fact the same type or the same individual is a category error about the fundamental structure of what is being examined. The questions that correspondence language makes intelligible — what licenses inference from one to the other? how far does the mapping extend? — become the wrong questions once identity is established. The entire framing of the analysis is wrong. This is not a minor omission; it is the difference between understanding a relationship and failing to understand it.

Existing frameworks treat identity as a separate metaphysical or logical topic, not as a required checkpoint in relational evaluation. Bunge and Schroeder observe that identity is a limiting case of analogy; they do not conclude that evaluating a relational claim requires checking whether this limit has been reached. The Hierarchy does.

This is reinforced by the Hierarchy's epistemic rather than ontological stance. Because it evaluates claims about perceptions under stated constraints rather than asserting metaphysical conclusions, the identity tiers are not ontological commitments but epistemic boundary tests. When identity cannot be established under the operative constraints, it does not hold for purposes of the analysis. This is not a denial of hidden metaphysical unity; it is a refusal to

treat that possibility as evidence. The correct response to "maybe these are really the same at some level we cannot access" is: "That is an ontological speculation outside the scope of this model. Under the stated constraints, identity does not hold."

This epistemic precision — distinguishing "testing identity is required" from "identity is required" — disarms a whole class of potential objections and prevents what might otherwise be read as aspirational drift toward unity at the expense of accurate characterization.

4. Recursive Application at Tier 4

A consequence of the Hierarchy's structure that has not been noted in existing literature is its recursive applicability. A proposed Tier 4 claim — that two things share Identity of Definition — is itself a relational claim about a proposed definition and the things it classifies. The Hierarchy can therefore be applied to candidate definitions: do the things in question actually instantiate the same specification, or does the proposed definition class them together at too coarse a level, or too fine? This is not a cosmetic observation. It means the Hierarchy provides a principled procedure for adjudicating definitional choices rather than treating them as arbitrary.

Floridi's method of levels of abstraction and analogy research on re-representation provide nearby support: the definitional granularity at which a Tier 4 claim operates is not free choice but is constrained by the relational claim under analysis. Two cars identical under one definition (same model and configuration) may not be identical under a finer one (transmission type). This is not a third identity tier in disguise; it is resolution-indexing within Tier 4, handled by specifying the operative definition explicitly. The recursive application of the Hierarchy to proposed definitions is the mechanism that enforces this.

This self-applicability is unusual. Most relational frameworks are not designed to evaluate their own components. The Hierarchy's five-tier structure turns out to be a tool not only for evaluating the relationships between external domains but also for disciplining the analytical choices the evaluation requires.

IV. What the Hierarchy Shares With Existing Work

Fairness requires acknowledging the genuine overlaps.

The Tier 1 / Tier 2 distinction recapitulates Goodman's critique and Gentner's central move. The principle that undifferentiated similarity is epistemically inert and that only specified structural correspondence provides traction is the foundational insight of the cognitive science of analogy since the 1970s. The Hierarchy's addition is formalizing Tier 1 as a positive category — the genuine recognition event that initiates analysis — rather than merely an error to be corrected.

The Tier 4 / Tier 5 distinction is the Peircean type-token distinction applied at the level of relational analysis. The distinction itself is not new. The Hierarchy's contribution is incorporating it into a unified hierarchy that begins with the analogy literature rather than treating it as a separate metaphysical topic.

The unification of analogy and identity on a single axis has, as shown above, scattered precedent in Bunge, Schroeder, and Woleński. The Hierarchy independently converges on the same move and builds substantially more structure on top of it.

The Tier 3 concept has partial precedent in Gentner's systematicity, Thagard's constraint satisfaction, and the philosophy of biology literature on convergent evolution. The Hierarchy's contribution is the explicit modal criterion — convergence forced by the problem's constraint space, not merely coherent or systematic correspondence — together with the solution-class specification, the at-least-one-mapping rule, and the constraint-entailed/narrative distinction. Of these, the last is most directly in conversation with Gentner: systematicity tracks structural coherence in a mapping; the Hierarchy asks whether individual correspondence elements can be derived from the constraints or merely fit within them. This is a sharpening of the systematicity criterion that the existing literature has not made explicit as a named distinction.

V. Originality and Value: A Calibrated Assessment

The honest calibration, based on a comprehensive survey of the relevant literature, is as follows:

The unification of correspondence and identity on a single axis is not unprecedented, but it has not previously been built into a working diagnostic taxonomy. Prior treatments offer scattered

remarks or formal mathematical sequences; the Hierarchy offers an instrument.

The Tier 2 / Tier 3 distinction — modal necessity as a tier boundary — appears to be a genuine synthesis. The ingredients exist in the literature (systematicity, constraint satisfaction, convergent evolution), but the explicit formalization of necessitation-by-governing-constraint as a named tier with explicit criteria is not found there.

The identity tiers as required completion tests — the normative rule that evaluation is incomplete without testing for collapse — appears to be the Hierarchy's most ownable and most explicit contribution. The literature separates identity from analogy; the Hierarchy requires that they be evaluated on the same pass.

The recursive applicability of the Hierarchy to its own definitional choices at Tier 4 is not present in the existing literature in this form.

What the Hierarchy most resembles, in terms of intellectual operation, is the kind of work described by Gentner herself as the most productive contribution analogy research can make to philosophy: not a new empirical finding but a diagnostic clarification of when relational inferences are and are not warranted, and why. The Hierarchy provides exactly this — a precise vocabulary for a common class of reasoning error, with a principled account of what distinguishes each level of claim from the one below it.

Its value is both theoretical and practical. Theoretically, it dissolves what has been treated as a category boundary (between correspondence and identity) and replaces it with a principled gradation, while simultaneously providing the strongest existing account of why Tier 2 and Tier 3 are genuinely different in their epistemic implications. Practically, it equips any analyst with a precise instrument for determining what a given relational claim licenses — and what it does not.

VI. The Remaining Open Question

The deepest unresolved challenge for the Hierarchy is shared with the laws-of-nature literature: how do we establish, in a given case, that a constraint is genuinely governing rather than a post-hoc description of observed convergence? The Hierarchy points to counterfactual and predictive tests as appropriate instruments — can the architecture be derived from the constraints without first observing the convergence? Does changing the constraints change or eliminate the solution class? These are the right instruments, and they align with the best available tools from Lewis, Tooley, and Armstrong. But they do not resolve the underlying modal metaphysics, and the Hierarchy does not claim otherwise.

Hesse encountered the same limitation with positive analogy sixty years ago. The analogy literature has lived productively with it ever since. The Hierarchy is in good company, and the limitation is real.

Research basis: This review draws on Nelson Goodman, "Seven Strictures on Similarity" (1972); Dedre Gentner, "Structure-Mapping: A Theoretical Framework for Analogy" (1983); Falkenhainer, Forbus, and Gentner, "The Structure-Mapping Engine" (1989); Paul Thagard et al. on constraint satisfaction and analogical mapping (1990); Mary Hesse, *Models and Analogies in Science* (1966); Imre Lakatos, "Falsification and the Methodology of Scientific Research Programmes" (1970); Mario Bunge (1967) on analogy and identity in quantum theory; Marcin Schroeder, "Analogy and Identity" (2019, MDPI); Jan Woleński on identity as a special case of analogy (2019); Simon Conway Morris, *Life's Solution* (2003); David Lewis, Brian Tooley, and D.M. Armstrong on laws of nature and accidental generalizations; Luciano Floridi on levels of abstraction; the Stanford Encyclopedia of Philosophy entries on analogical reasoning (Bartha, 2022), types and tokens, laws of nature, and the epistemology of modality; Amos Tversky, "Features of Similarity" (1977); Douglas Hofstadter, "Analogy as the Core of Cognition" (2001); and research on re-representation and encoding in analogical reasoning. Literature search conducted collaboratively by Claude (Anthropic) and ChatGPT (OpenAI).