The Diffraction Equation: A Formal Foundation for Ideamorphism

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The paper establishes a formal foundation for ideamorphism by deriving an equation that governs the magnitude of diffraction produced when a wave passes through a receiver's ouverture. Two observations open the argument: the divergence of interpretation across receivers facing the same work, and the calibration of receivers over time through exposure. From these regularities the paper distinguishes two systems operating in human transmission — a scientific system optimizing for fidelity between emitter and receiver, and a creative system optimizing for productive divergence — and shows that they share a variable space while pursuing opposite objective functions. The central result is the diffraction equation D(W, O) = (1 − S · r) / (S · r), relating diffraction magnitude to the wave's explicit signal S and the receiver's recognition capacity r, with r defined as a ratio against the emitter's own recognition. Both asymptotes — lossless transmission and maximum diffraction — are shown to be structurally unreachable, recovering Proposition 25's universal-diffraction claim as a property of the equation itself rather than an external assertion. The equation is decomposed into physical and intentional layers per Proposition 3, extended to the population case through the variance V(W) of diffraction across receivers, and given temporal dynamics through codex crystallization and receiver evolution. The paper verifies that the equation reproduces the 31 propositions of the ideamorphism framework under inspection, identifies the open problems reserved for subsequent papers — paired emissions, series, meta-emissions, multi-emitter populations, full instrumentation of S and r — and renders the framework's claims falsifiable for the first time.

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1. Introduction

Two observations, available to anyone who has spent time in the field of artistic transmission.

A roomful of viewers in front of the same abstract painting will produce different readings. The wave is invariant — same canvas, same dimensions, same pigments, the same physical fact reaching every eye. The readings are not. They spread. The spread is not random. Some works produce tight clusters of interpretation; others produce wide divergence. Watch this for long enough and the divergence acquires a shape — small when the work specifies more, large and growing when the work withholds. The shape is reliable enough that an artist can feel, before releasing the work, whether it will scatter or converge.

A North American ear and a European ear hearing the same music tap differently. The same wave arrives in both rooms. The North American body, calibrated by a lifetime of gospel, blues, jazz, soul, locks onto 2 and 4. The European body, calibrated by classical music, folk traditions, marches, locks onto 1 and 3. The music swings for one and does not quite swing for the other. Neither ear is wrong. Both are reading the wave according to their calibration, and the calibration is what determines how the wave maps into the body. Receivers are not fixed; they are trained. The European who lives in New York for ten years, who plays in jam sessions, who sits with the music night after night, will eventually feel the body migrate to 2 and 4. The wave never changed. The receiver did.

These two observations — the divergence of interpretation across receivers in the same moment, and the calibration of receivers over time — are the foundation of what follows. They are not laboratory observations. They are the sort of regularity any practitioner of the field witnesses over decades, and they are available to any reader who has stood in a gallery, who has come to hear music they could not previously hear, who has clapped on 1 and 3 in a room of Americans clapping on 2 and 4 and felt the mismatch in their own body.

The framework that names these regularities — ideamorphism, set out in the *Manifesto Ideamorphiste* [1] and elaborated in *The 31 Propositions of Ideamorphism* [2] — uses a small vocabulary that is worth introducing here, since the rest of the paper depends on it.

An **idea** is what is transmitted. Not data and not signal — the nucleus, prior to any specific modality of expression. A musical chord is an idea expressed in harmonic modality; a sentence is an idea expressed in prose modality. A **modality** is a register in which an idea takes form: sound, color, rhythm, space, language. A **codex** is the personal system of constraints through which an artist gives an idea its form in a specific modality — roughly, the artist's compositional logic, with a two-level structure of articulable rules and singular non-articulable habits. A **wave** is the structured emission released into the field once the codex has acted on the idea: the artwork as transmission rather than as object. An **ouverture** is the receiver's calibrated aperture — their training, history, attention, perceptual habits — through which the wave passes. **Diffraction** is what happens at that passage: the wave bends, scatters, and reassembles in the receiver as something the wave alone could not have produced. The result, in the receiver, is **creation** — new, irreducible to the wave or to the receiver alone. The **ricochet** is what returns to the emitter when the receiver's creation comes back through dialogue, so that the emitter discovers what the wave produced without their knowing.

The terms *wave*, *ouverture*, and *diffraction* are borrowed from physics deliberately. The borrowing is structural rather than literal — ideas do not travel through a physical medium and do not carry energy in joules — but the structural correspondence is precise: a disturbance propagating through a medium, passing through apertures, and bending in characteristic ways at each passage. No other English vocabulary carries that correspondence intact, and the deeper reason ideas exhibit wave-like rather than signal-like behaviour is taken up in §2.

Aesthetics has had attempts at formalization. Birkhoff's *Aesthetic Measure* [3] proposed M = O / C in 1933, mapping aesthetic value to a ratio of order over complexity. Bense and the Stuttgart school adapted Shannon's entropy to artworks in the 1960s [4]. Berlyne's experimental aesthetics derived inverted-U curves relating arousal to hedonic response [5]. More recently, processing fluency theory [6] and Schmidhuber's compression-progress account of creativity [7] have continued the project under different formal vocabularies. Each is a real attempt.

What these formalizations share is a starting point. They ask what makes a stimulus pleasing, beautiful, or aesthetically valuable, and they seek to predict that property from features of the stimulus or from the receiver's response to it. The equation, in these traditions, is a function from stimulus properties to aesthetic value.

This paper takes a different starting point. The two observations above do not point at value. They point at a *shape*: a curve that governs how readings spread across receivers as the relation between specification and recognition shifts. Ideamorphism, in the texts cited above, names what generates that shape. Its primitive is the gap, not fit. Its central object is the transmission system, not the stimulus or the response. Its core claim — $1 \neq 1$ — holds that perfect transmission is the failure mode and that the gap between what is emitted and what is received is the site where new creation lives.

This paper writes the curve as an equation.

The equation relates the magnitude of diffraction to two quantities: the wave's explicit signal, and the receiver's recognition capacity for that wave. It is bounded. Its asymptotes are structurally unreachable. It reproduces the framework's stated propositions under inspection. And it is, in principle, empirically testable.

Three claims are made. First, that the creative system — the system in which ideamorphism operates — is mathematically distinct from the scientific system, in that the two optimize opposite objective functions over the same variable space. Second, that the diffraction equation derives from the framework's existing propositions and requires no new metaphysical commitments. Third, that the equation makes ideamorphism's claims falsifiable in a way they were not before.

The paper is a foundation. It treats the simplest case — one emitter, one wave, one receiver — and writes the equation that governs that case. Extensions to paired emissions [8], to series and collections [9], and to meta-emissions where a corpus is paired with its documentary architecture [10] are reserved for subsequent papers in the program. Operationalization at scale, the multi-emitter case, and engagement with adjacent formal frameworks (information theory, symbol systems, category theory) are likewise reserved.

What follows is the foundation, no more.

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2. Two Systems

The natural objection at this point is that transmission is transmission, and that the existing apparatus of information theory — Shannon and what has been built on him — already governs how structured signals propagate from emitter to receiver. Why posit a second system at all?

The answer is that two different objects travel through human transmission, and they are not interchangeable.

The first object is **data**. A temperature reading. A bank balance. A GPS coordinate. A digit-by-digit message. Data has a definite content that can be encoded, transmitted, decoded, and verified. The receiver who decodes correctly has the same data the transmitter sent. Data is partitionable: it can be sent in any order, in fragments, and reassembled. The temperature reading "18.3°C" can be transmitted digit by digit, byte by byte, packet by packet, and rebuilt at the other end without loss. Data is, by its nature, *not subject to interpretation*. The number is the number. This is the object that information theory was developed for, and the apparatus of the scientific system — formal notation, peer review, replication, controlled vocabulary, mathematical proof — is what humans have built to keep data clean as it travels.

The second object is the **idea**. A poem. A painting. A philosophical proposition. A piece of music. A hypothesis in the moment of its formulation. Unlike data, an idea is subject to human interpretation by nature — not contingently, not because we lack a better encoding, but constitutively. An idea that did not require interpretation would not be an idea at all; it would be data wearing the costume of an idea. And unlike data, an idea is not partitionable. The first half of an argument cannot be sent separately from the second half, because the second half is shaped by the first. The opening of a poem cannot be transmitted without the rest, because the rest reshapes the opening in the receiver's reading. An idea is a structured whole whose parts cohere through internal relations, and that whole travels through the medium of attention as a single structured perturbation — which is to say, as a wave.

This is why ideas exhibit wave-like behaviour and data does not. Continuous structure travels as a wave; discrete content travels as a signal. The borrowing of *wave* from physics is not decorative; it tracks a substantive difference in what kind of object is being transmitted.

The two systems govern these two objects.

In the **scientific system**, the object is data, and the apparatus is engineered to maximize fidelity. Lossless transmission is the goal. Any divergence between what was sent and what was received is treated as error. Information theory describes the system formally; engineering pushes channel noise toward zero. $1 = 1$ is achievable in principle and approachable in practice, because data has no interpretive layer at which it can fail.

In the **creative system**, the object is the idea, and the apparatus is engineered around the fact that lossless transmission is structurally impossible. The receiver's interpretation is not a failure mode to be minimized; it is the locus of creation, and engineering the wave for productive divergence is what artistic craft consists of. Codex, ouverture, generative loss, ricochet — all are devices that operate in a regime where $1 \neq 1$ by the nature of what is being transmitted.

The two systems are not opposed and they are not alternatives. They run in parallel, all the time, in human cognition. Most actual transmissions carry both data and ideas, and the brain processes them simultaneously. A scientist looking at a temperature graph receives the data losslessly (the numbers are the numbers) and forms an idea about what the data means (this is warming, this is anomalous, this supports the hypothesis); both happen at once. A receiver in front of an abstract painting receives the physical layer of the wave largely losslessly (the painting's dimensions and pigments are what they are, and any two viewers can agree on them) and at the same time forms an interpretive idea that no other viewer would form identically; both happen at once. The scientific system handles the data layer of every wave; the creative system handles the idea layer. The double invariant of the wave that §6 of this paper develops formally — the distinction between the *physical invariant* and the *intentional invariant* of any emission — is the formal expression of this parallelism.

This paper formalizes the creative system. It does so without claiming that the scientific system is wrong, irrelevant, or in competition with it. The scientific system is correct for what it governs. This paper concerns what the scientific system does not govern: the irreducible interpretive layer of every wave that carries an idea, which is to say every wave that carries anything humans make, think, feel, or transmit beyond pure measurement.

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3. Variables

Five primitives organize the formal core. They are introduced in the order they enter the equation.

The idea, I. The framework's primitive transmitted quantity. An idea is what is transmitted. It is not data and not signal — it is the nucleus, prior to any specific modality of expression. The framework's name reflects this: ideamorphism is the shaping (-morphism) of ideas (idea-).

Modality, M. A surface of the single ideational interior. Per Proposition 9, all expressive modalities — sound, color, rhythm, space, language — belong to one ideational space. They are different surfaces of the same interior. Translation between modalities is possible because the separation has never been fundamental.

An idea expressed in a specific modality is written I(M). A musical chord is an idea expressed in harmonic modality. A sentence is an idea expressed in prose modality. A building is an idea expressed in architectural modality.

The codex, C. A personal system of constraints through which the wave takes its shape. Per Proposition 14, the codex operates at two simultaneous levels:

- *C_formal*: the rules, constraints, and system of transliteration. Articulable on request. The layer that can be shared, taught, explained.
- *C_intimate*: why these constraints rather than others — the singular logic of this particular ouverture. Non-reproducible. The layer that makes the codex specifically the emitter's own.

A codex is a function that maps an idea in source modality M to a wave in target modality M':

$$C : I(M) \to W \text{ in } M'$$

Both C_formal and C_intimate contribute to the wave. Borrowing C_formal from another emitter does not transfer C_intimate (Proposition 21).

The wave, W. The structured emission released into the field. The product of the codex acting on the idea:

$$W = C(I(M))$$

Per Proposition 3, the wave carries two distinct invariants:

- The *physical invariant*: the material fact of the wave — dimensions, colors, forms, sounds. Unconditionally stable. No ouverture can dissolve it.
- The *intentional invariant*: the structure encoded by the codex — why these forms, why these colors, according to what internal logic. Latent in the wave, activatable in dialogue, not automatically transmitted by perception of the physical layer alone.

Both invariants travel with the wave. They diffract differently in the receiver, and §6 splits the equation accordingly.

The ouverture, O. A receiver's optical, cognitive, and cultural aperture. Per Proposition 11, every sense is an ouverture — a narrow opening through which waves must pass. Each receiver is a distinct ouverture, calibrated by their training, history, and codex (if they have built one).

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4. The Diffraction Equation

When a wave passes through an ouverture, the result is not pure transmission but diffraction. The wave bends, scatters, and reassembles in the receiver as something that did not exist before. This is creation.

Two quantities determine its magnitude.

Explicit signal, S(W). A number in the open interval (0, 1). The proportion of the wave's content that is unambiguously specified, recognizable, closed, determinate. A wave with high S specifies much of what it is; a wave with low S leaves much unspecified.

Recognition capacity, r(O, W). The receiver's calibration to the specific wave, expressed as a ratio relative to the emitter's own recognition of their own wave. By construction, r ∈ [0, 1]: the emitter's own recognition is the unit, and every other receiver's recognition is measured as a fraction of it. r = 1 only in the limit case where the receiver is the emitter at the moment of emission — and even there, Proposition 16a's residual asymmetry of self-reception keeps the limit unreachable.

The framing of r as a ratio rather than as an absolute quantity reflects something the framework already claims about reception: the emitter's ouverture is the privileged one — the wave was shaped to fit it — and all other ouvertures are degrees of departure from it. Putting the emitter at the unit makes this structural fact explicit in the equation.

Recognition capacity is wave-specific: a trained pianist has high r for harmonic structures but lower r for architectural waves. It is also conceptually decomposable into two channels. The receiver may calibrate to the *formal* level of the codex — the rules, conventions, articulable structure — through training, study, or reading the codex if it has been published. The receiver may also calibrate, more rarely and partially, to the *intimate* level of

the codex — through sustained dialogue, embodied co-presence, or being the emitter. The two channels are redundant: either delivers recognition; together they reinforce. The exact functional form by which the channels combine is reserved for future work; what matters here is the bound on the ratio itself.

The relation between these two quantities and diffraction is the central claim of this paper.

$$D(W, O) = \frac{1 - S(W) \cdot r(O, W)}{S(W) \cdot r(O, W)}$$

D is bounded in the open interval (0, ∞). Its behavior follows from its form.

When the product S · r approaches 1, the numerator approaches 0 and D approaches 0. This is the *lossless asymptote* — the condition under which the wave passes through the ouverture without bending. *1 = 1*. No creation.

When the product S · r approaches 0, the denominator approaches 0 and D grows without bound. This is the *maximum-diffraction asymptote* — the condition under which the wave gives the receiver almost no specified content and the receiver must construct almost everything from their own ouverture.

Between the two limits, D varies continuously. Larger products produce smaller diffractions; smaller products produce larger ones.

Why this form.

The fraction is not arbitrary, and it is worth saying why no simpler form will do.

A difference, D = | S − r |, would treat S and r as competing quantities and permit D = 0 whenever S = r. The framework's foundational claim (Proposition 25) is that diffraction is universal — D > 0 for every transmission, without exception. A difference form makes the lossless condition merely contingent, an outcome to be avoided. The equation must rule it out structurally.

A multiplicative form, D = 1 − S · r, has the same problem. It admits D = 0 when S = 1 and r = 1, and it produces no asymptote at the high-diffraction end.

The fraction form treats S and r as cooperating quantities. Both must be high together for D to be low; either falling short pushes D upward. The form produces a finite minimum that is structurally unreachable, and a maximum that is also unreachable — the framework's universal-diffraction claim emerges as a property of the equation itself rather than as an external assertion. The next section shows how.

The equation captures *1 ≠ 1*. As long as the product S · r remains strictly below 1, the wave does not pass through unbent. The receiver creates.

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5. The Asymptotes Are Unreachable

The equation has two asymptotes. Both are unreachable. This is not a contingent observation; it follows from the framework's stated propositions.

Why S(W) < 1, always.

Per Proposition 14, the codex has two simultaneous levels. C_formal is articulable; C_intimate is non-reproducible. Both contribute to the wave. The intimate level is, by definition, the part of the codex that resists explicit specification — the singular logic of the particular ouverture, irreducible to procedure.

The wave therefore always carries content that exceeds what S captures. Even a wave produced by a fully crystallized and fully articulated codex still carries the intimate residue. S(W) tracks roughly the contribution of C_formal to the wave's specificity. C_intimate's contribution is real but cannot be made fully explicit.

S(W) < 1, always. The wave always carries more than it specifies.

Why r(O, W) < 1, always.

The bound on r follows directly from its construction. r was defined as the ratio of the receiver's recognition to the emitter's own recognition of their own wave. The unit is therefore reached only when the receiver *is* the emitter, sharing both the formal and intimate levels of the codex that produced the wave.

Proposition 16 already excludes this case from the productive territory of the framework: when the receiver and the emitter are the same person, the wave fits the ouverture that shaped it, and reception collapses to recognition rather than creation. Proposition 16a goes further: even self-reception is asymmetric across time. The artist who returns to a work after temporal distance is no longer quite the artist who made it. There is always residual diffraction, even in self-reception. The unit r = 1 is therefore approached but never reached, even by the emitter.

For any receiver other than the emitter, the bound is tighter still. The receiver may calibrate to the formal channel of the codex through study, including study of the codex if it has been published, and this calibration can be deep. But the intimate channel does not transfer. Sharing the formal codex without sharing the intimate codex leaves r below the emitter's unit by an amount that is exactly the unrecoverable intimate residue. Even a fully studied receiver remains structurally below 1.

r(O, W) < 1, always. The receiver is never the emitter, and the emitter is never quite themselves twice.

The lossless asymptote is unreachable.

If S < 1 and r < 1, then S · r < 1. The numerator of the diffraction equation is therefore always greater than 0, and so is D.

The lossless condition is not contingently absent. It is structurally impossible. Diffraction is universal — Proposition 25 — and the equation provides the structural reason: there is no path through the system in which a real wave passes through a real ouverture without diffraction occurring.

This rescues the framework from a potential inconsistency. Any equation that admitted D = 0 as an attainable state would have contradicted Proposition 25. The equation as written does not, and the framework's universal-diffraction claim emerges as a theorem of the formal apparatus rather than an external assertion.

The maximum-diffraction asymptote is also unreachable.

S · r approaches 0 only if S → 0 (the wave specifies nothing) or r → 0 (the receiver has no recognition capacity). Neither is realizable. A wave with S = 0 is not a wave at all — it is the absence of structure, which cannot be emitted. A receiver with r = 0 for a wave they encounter has no perceptual access to it; they are not a receiver in any meaningful sense.

The maximum-diffraction asymptote is therefore also a limit, not a state. D is bounded above by some practical ceiling determined by the lowest realizable S · r product, but it does not reach infinity.

The system lives entirely in the open interval. The equation is finite, well-behaved, and structurally bounded within (0, ∞) without ever reaching either endpoint.

Disclosure does not deplete.

A consequence worth naming explicitly. The framework's commitment to explicability (Proposition 19a) requires the codex to be articulable on request. A naive reader might worry that publishing the codex collapses the diffraction it produces — that once the rules are given, the wave passes through unbent.

The equation rules this out. Publishing the codex moves the formal channel of r upward across the field; studied receivers calibrate, and the gap between their reception and the emitter's narrows. But the unit against which the ratio is measured does not move. The emitter's own recognition stays where it is. The intimate channel of the codex does not transfer to studied receivers no matter how complete the formal disclosure. The ratio r therefore rises but cannot reach 1, and the diffraction survives the disclosure. Publishing the rules does not let the receiver hear the chord through the painting the way the emitter hears it. The receiver who has read the codex experiences a particular kind of diffraction — the recognition that they can read the rules and still not reach the wave — and that experience is itself a creation. The equation predicts what the framework already claimed: full ideamorphism does not collapse under its own explanation.

6. The Double Invariant

The single-equation form above conflates two quantities the framework distinguishes. Per Proposition 3, the wave carries a *physical invariant* (dimensions, colors, forms — perceptible, unconditionally stable) and an *intentional invariant* (the codex-encoded logic — latent, activatable in dialogue). They are not the same.

The equation splits accordingly.

Physical-layer diffraction:

$$D_{\text{physical}}(W, O) = \frac{1 - S_{\text{physical}}(W) \cdot r_{\text{physical}}(O, W)}{S_{\text{physical}}(W) \cdot r_{\text{physical}}(O, W)}$$

S_physical is the proportion of the wave's *material* content that is unambiguously specified. The physical invariant tends to be high — the wave's dimensions, colors, and forms are objectively present. r_physical is the receiver's basic perceptual access, which is high for any receiver who encounters the wave at all. D_physical therefore tends to be small. Most receivers see roughly the same painting, hear roughly the same chord.

Intentional-layer diffraction:

$$D_{\text{intentional}}(W, O) = \frac{1 - S_{\text{intentional}}(W) \cdot r_{\text{intentional}}(O, W)}{S_{\text{intentional}}(W) \cdot r_{\text{intentional}}(O, W)}$$

S_intentional is the proportion of the wave's *codex-encoded* content articulable on request. This tends to be lower — the codex is partially opaque, the intimate level resists explicit specification. r_intentional is the receiver's calibration to the codex, which varies widely across the population. D_intentional therefore dominates.

Total diffraction:

$$D_{\text{total}}(W, O) = D_{\text{physical}}(W, O) + D_{\text{intentional}}(W, O)$$

For most artworks, D_physical is small and D_intentional dominates. The framework's claim that creation lives at the intentional layer is now formal: most diffraction occurs because the receiver cannot read why the wave is structured as it is, not because they cannot perceive its physical content.

D_physical is not zero, however, and in some cases is non-trivial. Works that use unusual materials, scales, or sensory modalities can produce real D_physical, because the receiver's physical access is itself unusual. This becomes important for the recursive case in [10], where the wave's physical structure is itself unfamiliar at the meta-level.

The decomposition is reintroduced when the distinction matters. In what follows, the paper uses the total D when context is clear.

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7. The Population

A single-receiver equation describes one transmission event. Per Proposition 17, a single emission produces N creations, where N is the number of receivers. The paper has to write down what happens across the field.

For a population of receivers with ouvertures O_1, O_2, ..., O_N, the total diffraction generated by the emission is the sum:

$$D_{\text{field}}(W) = \sum_{i=1}^{N} D(W, O_i)$$

Or, in continuous form, with ρ(r) the density of receivers in the field whose recognition capacity for the wave is r:

$$D_{\text{field}}(W) = \int D(W, r) \cdot \rho(r)\, dr$$

The total is not the most important quantity. What matters more is the *diversity* of diffraction across the population.

Variance of diffraction:

$$V(W) = \text{Var}\left(D(W, O_i)\right) \text{ over the population}$$

A wave with high V produces genuinely different diffractions across diverse ouvertures. A wave with low V produces nearly the same diffraction everywhere — even when the magnitude is large.

The distinction formalizes the dilution crisis (Proposition 22). When a population's ouvertures synchronize, ρ(r) concentrates around a single value, and V(W) collapses. D_field may remain large in raw magnitude, but it represents one diffraction replicated N times — not N distinct creations. Ten million views is not ten million creations. It is one recognition, replicated.

The artist's objective function.

The artist designs W (through C) to maximize the diversity of diffraction across the field, subject to a constraint that D remain nonzero everywhere in it:

$$\text{Maximize } V(W)$$

$$\text{Subject to: } D(W, O_i) > \text{some floor, for all } i$$

In words: the artist wants the wave to produce *different* diffractions in different ouvertures, while still producing *some* diffraction in every ouverture the wave reaches. A wave that diffracts massively in one quarter of the population and not at all in the other three-quarters has high V but is not the engineered ideamorphic wave the framework calls for. The framework calls for a wave that diffracts diversely across the field — different magnitudes, different content — but reaches every receiver.

This is the formal expression of Proposition 12's double-edged calibration. The artist designs S as a layered profile — surface accessible to uncalibrated ouvertures, depth resistant to expert ouvertures — so that no single ouverture can match S across all layers, and every ouverture experiences diffraction at some layer.

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8. Temporal Evolution

The equations above are static. The framework is not. The codex changes over time (Propositions 14a, 14b). The receiver's recognition capacity changes with exposure (Proposition 12). The ricochet feeds the artist's next emission (Proposition 18a).

Codex crystallization.

The codex at iteration t produces a wave W_t. The wave reaches the field. The ricochet returns to the emitter, carrying traces of the receivers' creations.

$$C_{t+1} = C_t + \alpha \cdot \Delta(W_t, \text{ricochet}_t)$$

α is the rate at which the artist incorporates ricochet into codex revision. Δ is the adjustment driven by what the ricochet reveals.

For a proto-codex, α is high. The codex changes substantially with each iteration. The artist's body of work shows visible bifurcations, abandoned directions, exploratory variations. Per Proposition 14a, emissions from a proto-codex are real — they diffract — but the intentional invariant is unstable across the corpus.

For a crystallized codex, α is low. The codex absorbs ricochets without restructuring. New ricochets refine but do not destabilize.

Crystallization is the asymptotic process α → 0, with C_t converging on a stable C*. Per Proposition 14b, C* is not final. A sufficiently disruptive ricochet — an unexpected reception, an encounter with a new modality, a structural challenge — can spike α and force recrystallization at a deeper level.

Receiver evolution.

For a given receiver O exposed to wave W repeatedly:

$$r(O, W, t+1) = r(O, W, t) + \delta \cdot \text{exposure\_event}(t)$$

Each encounter increases the receiver's recognition capacity for the wave. The increment δ shrinks as r approaches its ceiling.

$$r(O, W, t) \to r_{\text{ceiling}}(O, W) < 1 \text{ as } t \to \infty$$

A single wave, encountered repeatedly by the same receiver, produces decreasing diffraction over time. The receiver learns the codex; the wave becomes recognizable; D decays toward a small residual. This is Proposition 12's first edge — calibration to a wave reduces diffraction on that wave.

But r_ceiling is wave-specific. The same receiver encountering a *different* wave from a different codex begins again at low r. This is Proposition 12's second edge — calibration in one register does not transfer to another.

The two dynamics together explain the dilution crisis as a temporal phenomenon. As the field is exposed repeatedly to similar waves from synchronized emitters, r approaches r_ceiling for those waves across the population, and D collapses across the field. The escape is novelty in modality, register, or codex — anything that resets r to its base level for a new wave.

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9. Operationalization

S and r have been introduced as quantities in the open interval (0, 1). The paper has not yet stated how they would be measured. This section sketches the operationalization and identifies what is required for empirical testing.

Measuring S(W).

S(W) is not a property of the wave alone. It is a property of the wave relative to a reference field of recognition. A figurative portrait of a known face has high S in a culture where that face is recognized; the same painting has lower S in a culture where the face is unfamiliar.

S is implicitly conditional: S(W | F), where F is the reference field. The natural choice for F is the population's average recognition capacity — the expected r across the population.

Operationally:

$$S(W) \approx \text{the convergence rate at which independent receivers in the reference field identify the wave's specified content}$$

If 100 receivers from the population are asked to identify what the wave specifies, and 90 converge on the same identification, S is approximately 0.9. If only 30 converge, S is approximately 0.3.

This is empirical and measurable. It is also what S *should* mean — the wave's specificity is exactly the degree to which it is read the same way by independent receivers in the same field.

Layered S.

Per Proposition 12, S is not a scalar. The artist designs a layered profile across surface, middle, and deep levels of the wave. Each layer has its own convergence rate.

$$S(W) = \{S_{\text{surface}}, S_{\text{middle}}, S_{\text{deep}}\}$$

A figurative portrait might have S_surface ≈ 0.95, S_middle ≈ 0.6, S_deep ≈ 0.2. A pure abstraction might have S_surface ≈ 0.4, S_middle ≈ 0.15, S_deep ≈ 0.05.

Diffraction occurs at the layer where S and r mismatch. The artist's task is to design a layered profile that produces diffraction at *some* layer for *every* receiver in the field.

For the equation as written, the scalar form is sufficient. The layered form is a refinement to be operationalized in subsequent work.

Measuring r(O, W).

r is the receiver's calibration to the specific wave. It can be approximated through prediction:

$$r(O, W) \approx \text{prediction accuracy of } O \text{ on a held-out test set of waves } W' \text{ produced by the same codex (or a closely related codex)}$$

This is how cognitive science measures perceptual expertise. The framework's r is not exotic — it is a quantity already studied in expertise research, attention research, and learning research, under different names.

A more decomposed form:

$$r(O, W) \approx \text{base\_r}(O) + \alpha \cdot \text{exposure}(O, W) + \beta \cdot \text{training}(O, \text{codex of } W)$$

base_r is the receiver's general capacity. Exposure is prior encounters with W or similar waves. Training is formal calibration to the codex. α and β are weighting coefficients.

Both quantities — S and r — are operationalizable in principle. The full instrumentation is reserved for a separate methodological paper.

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10. Coverage of the Framework

This section verifies that the equation reproduces the framework's stated propositions. The exercise is grouped by theme: ontology, codex structure, transmission dynamics, population effects, and craft.

Ontology of transmission. The equation reproduces the framework's foundational claims about what transmission is and how creation arises from it. Universal diffraction (Proposition 25) follows from the structural impossibility of the lossless asymptote. Generative loss (Proposition 13) is the formal expression of S · r < 1: the gap between specification and recognition is what produces creation, not what fails it. The receiver as creator (Propositions 1, 17) is captured by the equation's production of distinct D values across distinct ouvertures: N receivers, N diffractions, N creations. Sensory diffraction (Proposition 11) is built into r as the partial calibration of any ouverture to any wave. Multimodal unity (Proposition 9) is presupposed by the codex C : I(M) → W in M', which assumes a single ideational space with M and M' as surfaces.

Codex structure. The decomposition C = C_formal + C_intimate reproduces the two-level structure of Proposition 14. The robustness of the intentional invariant (Proposition 3a) follows from the stability of C_formal: a stable formal codex produces a stable S_intentional, which produces consistent intentional-layer diffraction across receivers. The double invariant (Proposition 3) is reproduced through D_total = D_physical + D_intentional, with each layer governed by its own (S, r) pair. Codex authenticity (Proposition 21) appears as a coherence assumption: the equation assumes C_formal and C_intimate are aligned within the same emitter; borrowed codices produce structurally counterfeit diffraction, treated as a separate phenomenon outside the equation's scope. The proto-codex / crystallization dynamics (Propositions 14a, 14b) are reproduced through the temporal evolution C_{t+1} = C_t + α · Δ.

Transmission dynamics. Otherness of reception (Proposition 16) is captured by the structural impossibility of r = 1 even in self-reception. Diagnostic self-reception (Proposition 16a) follows: the artist's residual D when receiving their own work is the diagnostic instrument, made possible by temporal distance. Explicability (Proposition 19a) appears as the requirement that S be specifiable as a function of C_formal — without explicability, intentional-layer diffraction is real but undiagnosable. The ricochet effect (Proposition 18a) is reproduced through the codex update equation: the ricochet is the mechanism by which the codex learns from what the wave produced.

Population effects. Ouverture calibration (Proposition 12) is reproduced jointly through the temporal evolution of r toward r_ceiling and through the layered S profile. The dilution crisis (Proposition 22) is the population-level phenomenon in which ρ(r) concentrates and V(W) collapses. The diffraction imperative (Proposition 23) follows from the equation's central asymmetry: low D produces recognition, comfort; high D produces creation. The gradient of presence (Proposition 24) appears as the claim that mediation alters the wave's S profile — generally lowering S in some layers — and therefore reduces the diffraction the wave can produce.

Craft. Diffractability as craft (Proposition 19) is exactly the artist's optimization problem: maximize V(W) subject to a floor on D across the field. Engineered diffraction (Proposition 26) is the process by which S is positioned relative to ρ(r) to maximize diversity of diffraction. Method as variable (Proposition 27) is reflected in the requirement that there be a codex of some form for any meaningful S to exist; the form is left open. The game principle (Propositions 28, 30) is preserved by the equation's constitutive asymmetry: the artist designs C, S, and the conditions of the wave; the receiver's O determines K through diffraction; pre-conception, not pre-determination.

Out of scope or reserved. Six propositions are out of scope for the formal core: Propositions 4 and 5 (modal/possibility structure of the idea itself), Proposition 6 (gestural intention), Proposition 18 (propagation as purpose), Proposition 20 (synchronization of multiple emitters), and Proposition 31 (ethical center). These are metaphysical, normative, or population-of-emitters claims that the diffraction equation does not natively address. Their absence from the formal core does not contradict the framework; they are simply outside what this paper formalizes. Two propositions are reserved for subsequent papers in the program: Proposition 8 (seriality), addressed in [9], and Proposition 10 (persistence), addressed in [10].

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11. Open Problems

Five problems remain open and are stated here for clarity.

Paired emissions. The equation as written treats one wave addressed to one receiver. Many actual emissions are paired: a painting and its title, a poem and its dedication, a score and its performance notes. The pair is jointly addressed and jointly diffracted. Extending the equation to the (W_1, W_2) case requires a coherence variable governing the relation between the two waves and an account of how their joint S and r profiles produce a combined diffraction. Reserved for [8].

Series and collections. A series of n waves from the same emitter, sharing a codex, addressed to receivers as a coherent unit, has its own diffraction dynamics. The receiver's r at element k is conditioned by their exposure to elements 1..k-1; the series teaches its own codex; diffraction shifts from the codex level to the variation level as the series unfolds. Reserved for [9].

Meta-emissions. When a corpus of emissions is paired with a documentary architecture in a many-to-many relation, the result is a meta-emission whose diffraction operates at a structural level distinct from any of its constituent waves. The recursive case — input modality is itself the output of prior ideamorphic operations — is the central object of [10].

Operationalization at scale. S(W) and r(O, W) have been operationalized in principle, through convergence rates and prediction accuracy respectively. The full instrumentation — protocols, sample sizes, controls, validity conditions — is reserved for a methodological paper. Empirical testing of the equation requires this instrumentation to be developed.

The population of emitters. The current paper formalizes one emitter and a population of receivers. Proposition 20 addresses the dual case — multiple emitters with overlapping codices — and is not covered here. A multi-emitter generalization is reserved.

Two further problems are flagged but not pursued. The formal treatment of *counterfeit diffraction* (Proposition 21), which arises when a borrowed codex produces real D in receivers despite a hollow intentional invariant in the wave, would require a coherence diagnostic operating on the ricochet pattern rather than on the wave directly. The formal treatment of *mediation and the gradient of presence* (Proposition 24) would specify how different media transform the wave's S profile — what is preserved, what is degraded, what is added. Both are reserved for later work.

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12. Conclusion

The equation:

$$D(W, O) = \frac{1 - S(W) \cdot r(O, W)}{S(W) \cdot r(O, W)}$$

derives from the framework's existing propositions and reproduces them under inspection. It is bounded in the open interval (0, ∞), with both asymptotes structurally unreachable. It captures the framework's foundational claim that perfect transmission is impossible and that the gap between specification and recognition is the site of creation.

The equation distinguishes two systems operating on the same variable space with opposite objective functions. The scientific system maximizes the product S · r, pushing toward fidelity. The creative system maximizes the diversity of diffraction across the field, V(W), accepting that the lossless asymptote is unreachable and that the gap is generative rather than erroneous. An artwork and a scientific paper are not different kinds of objects so much as objects produced under opposite optimization criteria over the same variable space.

The equation makes ideamorphism's claims falsifiable. The framework's assertions — universal diffraction, generative loss, the multiplication of creation — become quantitative propositions with measurable consequences. The artist's task — diffractability as craft — becomes a tractable optimization problem. The dilution crisis becomes a population-level phenomenon that can be observed and measured.

The paper is a foundation, no more and no less. Paired emissions, series, meta-emissions, the multi-emitter case, the formal treatment of mediation and counterfeit diffraction, and the full instrumentation of S and r are open territory, each reserved for a subsequent paper in the program.

The equation does not settle what ideamorphism is. It states what ideamorphism *says*, in a form that allows the saying to be tested. What returns from the field will determine the rest.

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