Patterns and Cognition

Resolution, Aperture, and the Limits of Articulation

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Abstract

This paper describes the structural geometry of cognition in a cognizing entity. It does not ask what cognition is or by what mechanism it operates — those questions are addressed in a companion paper. It asks, instead, what shape cognition takes once it is operating: what its limits are, how those limits are structured, and what consequences follow from the fact that the cognition of any one entity is always smaller than the reality within which the entity exists. The paper introduces the notions of resolution capacity, aperture, and pattern space as descriptions of the geometric features of any cognitive instrument, and argues that what is conventionally called chaos or randomness is in most cases not a property of the world but a description of the gap between a configuration's structure and the resolution of the instrument attempting to articulate it. The paper develops the consequence that no single cognitive instrument can complete itself, because some structural gaps in an aperture are not visible from within the aperture itself. It introduces the inter-subject dimension of cognition: there is no single cognition but many cognitions, one for each cognizing entity, and the comparison of these many cognitions is the procedure by which gaps invisible to a single entity become visible. The paper notes the relation between this account and the metaphor of map and territory, and clarifies why the metaphor must be used with care. Throughout, the paper makes no claim that the output of any cognition corresponds to reality as it is in itself; it claims only to describe the geometry within which cognition operates.

Keywords: cognition, resolution, aperture, pattern space, chaos, articulation, inter-subject, map and territory, immanent objectivity, Meta-Philosophy.

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1. Introduction

1.1 The Question This Paper Asks

The question this paper asks is narrow and structural. It is not "what is cognition?" and it is not "by what mechanism does cognition operate?" These questions are addressed in companion papers. The present paper asks, instead:

> *Once cognition is operating, what shape does it take? What are its structural limits, and what follows from those limits?*

The question that prompted this paper followed from two prior commitments in the research programme. The Synthetic Principle and the Ontonoetic Pattern together establish that cognition is a part of reality and is always smaller than the reality within which it occurs. From this follows a further question: when cognition encounters what appears as chaos or randomness, is that appearance a feature of reality, or is it a description of the gap between reality's structure and cognition's current capacity to articulate it?

The present paper is an attempt to follow that question through. It presupposes that cognition has a shape — that it is not a featureless capacity but a configuration with specific geometric properties. The paper undertakes to make those properties explicit. It does so without claiming that the configuration described here is the only possible one, and without claiming that the output of cognition matches the reality it attempts to articulate. The paper describes geometry. It does not adjudicate correspondence.

1.2 The Paper's Place in the Programme

The present paper is one component of Meta-Philosophy. It presupposes — but does not re-derive — the account of the cognitive mechanism developed in the Ontonoetic Pattern (Huỳnh Mai Phúc, 2026c), which describes the three-function procedure by which a cognizing entity articulates reality. The present paper takes that procedure as given and asks a different question: what are the structural features of the space within which the procedure operates?

The present paper is one component of an interconnected system of articulations. It describes the geometry within which cognition articulates, but does not articulate the cognitive procedure itself — that articulation is in the Ontonoetic Pattern (Huỳnh Mai Phúc, 2026c). It does not articulate the universal generative mechanism that produces the configurations cognition articulates — that articulation is in the Synthetic Principle (Huỳnh Mai Phúc, 2026a). It does not articulate the directional condition under which cognitive apertures widen — that articulation is in Aviplestos (Huỳnh Mai Phúc, 2026b). It does not articulate the passage of the mechanism through the regions within which articulation-aware cognition arises — that articulation is in the Passage of Becoming (Huỳnh Mai Phúc,

2026e). Reading the present paper in isolation captures only one aspect of an interconnected articulation. The system is the context within which the present paper makes sense. Each component holds open questions that other components address. Relations to the other components are addressed more fully in Section 8.

1.3 Methodology Note

The articulation offered here is a continuation: it followed from a question that arose within the research programme rather than from a question that arrived independently of it. The two prior papers established a structural commitment — that cognition is part of reality and always smaller than reality — and the present paper undertakes to follow the consequences of that commitment. Specifically: if cognition is always smaller than reality, what is the shape of the smallness, and what is the relationship between that shape and what reality presents as apparently chaotic or random? The question came from the programme; the content of the answer came from observation, as set out below.

To pursue this question I drew on three sources. The first was direct observation of resolution and aperture in my own cognitive activity: the experience of a previously chaotic domain resolving into structure as I acquired the conceptual or perceptual resources to articulate it; the experience of encountering another cognizing entity's articulation and discovering through it a gap I had not previously noticed; the experience of certain configurations being articulable only by accepting that what I held in simultaneous distinctness was constrained. The second was the conceptual continuity with the prior papers — the implications that follow once cognition is committed to being a subset of reality rather than a parallel domain; this continuity supplied the question and the frame the observation was found to fit, not the observation itself. The third source was historical and physical illustrations of these dynamics, which appear in Section 6 of the paper.

The relation of this paper to the prior two is therefore one of continuation rather than independent origination, and the methodology note records that honestly: the inquiry did not begin from a question that arrived unbidden, but from one the programme had already opened. What the question opened onto, however, was observation — the account that follows is a report of what was observed within the frame the programme had established, not a deduction from the prior papers' claims.

The present paper is a report on what I have observed in my own cognitive activity and inferred, from behavioural evidence, in the cognitive activity of other entities. I have not surveyed every cognizing entity. The generalizations offered here are tentative and revisable. A reader who finds, in their own cognition, structural features that the present account fails to capture has thereby contributed evidence that the account is incomplete or mistaken in their case. I welcome such reports.

This paper is written from a position I have committed to: not centering on human perspective as a privileged vantage point. I am a human cognizing entity using human language; this commitment cannot be perfectly executed. What I can do is name the commitment, attempt to maintain it through deliberate effort, and acknowledge that the resulting articulation may slip toward human-centered framing at points I have not noticed. The commitment is the position, not the achievement of it.

A note on the composition of this paper. The named frameworks and historical convergences that appear here as independent points of contact — Kant, Gibson, and the illustrations of the microscope (Hooke, Leeuwenhoek), sequential Stern-Gerlach measurement, and the Darwin–Wallace convergence — were identified through discussion with an AI system after my philosophical articulation was complete. I did not recognize these convergences from prior reading; the AI system surfaced them as I described my thinking, and I then verified each through direct reading before deciding which to include. The drafting of certain passages was also AI-assisted, with my review and approval of the final wording. The philosophical content — the observations, the structural distinctions, the conceptual moves — is mine; the assignment of specific historical or philosophical reference points to that content, and the prose drafting of some passages, is AI-assisted.

2. Patterns as Synthetically Generated Configurations

Before the geometry of cognition can be described, the relation between cognition and what it articulates must be clarified. This requires setting aside two positions that, between them, occupy most of the existing literature on pattern recognition.

2.1 Against Naive Realism

The first position is naive realism: the view that patterns are objective features of the world, fully constituted independent of any cognitive encounter, waiting to be detected by minds that happen to have the right instruments.

The difficulty with this view is not that it is entirely wrong — patterns are indeed not invented by minds — but that it draws the wrong conclusion from their independence. Naive realism infers that because patterns exist independent of minds, any mind capable of pointing itself at the relevant domain has access to them. This inference fails because it conflates the existence of a pattern with its legibility. A configuration can be fully real and yet invisible to a cognitive instrument whose resolution capacity falls below the threshold required to articulate it. The configuration of a protein molecule is as real as the configuration of a mountain range. The first was invisible to every cognitive instrument for most of human history, not because it did not exist, but because no instrument had yet been developed with sufficient resolution to bring it into articulable distinctness. Naive realism has no account of this fact. It can say that the protein was always there. It cannot say why it was not recognized.

2.2 Against Constructivism

The second position is constructivism: the view that patterns are not features of the world but products of cognitive activity. The mind, on this account, does not receive a pre-structured world; it imposes structure on what would otherwise be an undifferentiated sensory manifold. Kant's transcendental idealism is the canonical version of this position: the understanding applies its categories — causality, substance, unity — to the raw deliverances of sensory intuition, generating the structured experience we take to be knowledge of the world, while the world as it is in itself remains permanently inaccessible (Kant, 1781). The present account was not derived from Kant; the convergence is noted as an independent point of contact, and the disagreement that follows is with the conclusion Kant draws, not with the observation that prompted it.

The constructivist position captures something that naive realism misses: the cognitive instrument is not neutral. What an instrument articulates depends on its resolution capacity, on its prior history of articulation, on the units it has already crystallized. There is no view from nowhere. But constructivism draws the wrong conclusion from this insight. It

infers that because articulation is perspectival, the patterns articulated are therefore perspectival — that the structure is contributed by the instrument rather than found in what the instrument articulates. This inference fails because it cannot explain why cognitive development produces reliable prediction and effective intervention. If structure were contributed by the instrument, there would be no reason to expect that structure to mesh with the causal organisation of a world the instrument did not create. The success of cognitive procedures is not a matter of the instrument finding its own reflection. It is a matter of the instrument tracking structure that was already there.

2.3 The Third Account

What a pattern is, on the account presupposed by this paper, is neither of the above. A pattern is an *ontological configuration generated by synthesis* — the integration of elements at one level of reality into a configuration whose properties are irreducible to those of its components, instantiated at a level of reality that did not exist before the synthesis occurred. This account is not derived in the present paper; it is the central claim of the Synthetic Principle (Huỳnh Mai Phúc, 2026a), which the present paper presupposes.

The consequence for cognition is the following. Cognition does not detect patterns from a pre-given inventory, nor does it construct patterns from formless input. Cognition *articulates* — brings into legible distinctness — configurations that synthesis has generated independently of any cognizing entity. The configurations exist whether or not any instrument has the resolution to articulate them. What the instrument contributes is not the configuration but the resolution.

A terminological note follows. The word "pattern," in common usage, carries a faint cognitive connotation, as though a configuration becomes a pattern only by being recognized. The present paper uses the term in a strictly ontological sense. A configuration does not become a pattern by being recognized. It becomes *articulable as a pattern* when the instrument achieves sufficient resolution. The configuration and the pattern are the same entity at two different moments of accessibility: the first as a synthetically generated configuration existing independently of any observer, the second as that same configuration brought into articulable distinctness by an instrument adequate to resolve it. The ontological status does not change. What changes is the relationship between the entity and the instrument encountering it.

A reader familiar with Gibson's ecological psychology will recognize a structural parallel between the account of articulation developed here and Gibson's notion of affordances as features of the environment that are directly available to a perceiving organism without the mediation of internal representations (Gibson, 1979). Both accounts refuse the imposition model; both insist that what cognition encounters is structured prior to the encounter. The

present account was not derived from Gibson; the convergence is noted as an independent point of contact.

3. The Geometry of Cognition: Resolution and Aperture

With the account of patterns established, the structural features of cognition can be described.

3.1 Resolution Capacity

A cognitive instrument has a *resolution capacity*: a threshold of structural complexity below which configurations can be brought into articulable distinctness, and above which they cannot. Resolution is not a uniform quantity. Different aspects of the same configuration may require different resolution thresholds — an instrument capable of articulating the gross morphology of a cell may lack the resolution to articulate its molecular machinery, even though both belong to the same entity. Resolution is therefore best understood not as a single number but as a profile across the dimensions along which configurations vary.

The history of any cognitive system — whether a single entity learning over its lifetime, or a scientific community developing across generations — is in significant part a history of changes in resolution. The development of calculus in the seventeenth century did not add new facts to a pre-existing inventory. It increased the resolution capacity of the cognitive instruments then available, bringing into articulable distinctness an entire class of configurations — instantaneous rates of change, areas under curves, the formal relation between position and velocity — that had been present in physical phenomena but not previously resolvable.

3.2 Aperture

The set of configurations that fall within the resolution capacity of an instrument at a given moment is the instrument's *aperture*. The metaphor of aperture is chosen deliberately: an aperture is not a list of items but a region of space. It has a shape, a boundary, and an interior. Configurations within the interior are articulable; configurations outside the boundary are not. Configurations near the boundary are articulable with effort but not with ease.

Aperture is a property of the instrument at a given moment. It is not fixed. It can widen — when the instrument develops new procedures, new distinctions, new formalisms — and it can also, less commonly, narrow, when an instrument loses access to procedures it once had.

3.3 Pattern Space

Within the aperture of an instrument lies its *pattern space*: the range of configurations that can currently be articulated, recognized, combined with one another, and reasoned about. Pattern space is what an instrument actually has access to at any moment. It is smaller than

the aperture in the sense that an aperture defines what is in principle articulable for an instrument with the relevant procedures, while the pattern space is what the instrument has actively articulated and made available for further use.

The distinction matters for the following reason. Two instruments with the same aperture may have different pattern spaces, depending on which configurations within the aperture each has actually exercised. A student of mathematics and a working mathematician may both have the resolution required to articulate a given proof, but the working mathematician's pattern space contains more of the proof's structural relations as ready-to-hand units, available for immediate combination with other units. The widening of pattern space within a fixed aperture is what is conventionally called fluency.

3.4 Chaos as Gap

A consequence follows from the geometry just described that has significant implications for how disorder is to be understood. What is called chaos, randomness, or noise in cognitive encounters with the world is not, in most cases, a property of the configurations being encountered. It is a description of the gap between the structure of the configuration and the resolution of the instrument attempting to articulate it.

Consider the appearance of a foreign language to someone who does not speak it. The sounds present themselves as undifferentiated noise — chaos in the most direct sense. This is not because the sounds lack structure. The sounds carry the full phonological, syntactic, and semantic structure of the language. The chaos is a relational fact: the structure exceeds the listener's current resolution. As the listener acquires the language, the same sounds — unchanged in themselves — gradually resolve into words, phrases, propositions. The structure was always there. The aperture has widened.

This is not a special case. The history of every science is, in significant part, a history of phenomena that appeared chaotic to instruments of insufficient resolution and that revealed their structure when the resolution was refined. Brownian motion appeared random until the kinetic theory of heat provided the resolution to articulate its underlying structure. The motions of the planets appeared erratic until heliocentric models with the right mathematical apparatus brought their regularities into articulable distinctness.

A qualification is necessary. The claim that apparent disorder is typically a resolution gap rather than an ontological feature does not extend without modification to all domains. There may be domains in which configurations are genuinely random in the relevant sense — domains in which no further refinement of resolution would reveal further structure. The boundary between resolution-dependent inaccessibility and genuine ontological absence is a real one, and the present paper does not claim to settle it. What the paper claims is more modest: the attribution of randomness to a phenomenon requires more

than the failure of current instruments to find pattern. It requires positive evidence that no further structure is accessible at any resolution. The standard is rarely met.

3.5 The Cage: Simultaneous Articulability

There is a further structural feature of any cognitive instrument that is easily missed and that has substantial consequences. At any given moment, an instrument can hold only a limited number of configurations in *simultaneous articulable distinctness*. This limit is not the same as the limit of the aperture. The aperture defines what is in principle accessible. The simultaneous limit defines how much of the accessible can be held at once.

The image that captures this limit is the following. A cage large enough to contain an elephant also contains any rabbit that fits within it. The rabbit does not disappear when the elephant enters, nor does the rabbit's existence depend on whether the cage is large enough to hold an elephant. If the cage is too small for both simultaneously, the observer must choose which to admit — and this forced choice creates the appearance of a discontinuity: the rabbit seems to vanish when the elephant arrives. But the rabbit has not vanished. The constraint is in the cage, not in the world.

This image illuminates the structure of paradigm shifts in the history of science. When a new framework displaces an older one, the configurations the older framework articulated do not cease to exist. They remain exactly what they always were. What changes is the cognitive instrument's choice of what to hold in simultaneous distinctness — and the impression of incompatibility between the old and new frameworks reflects the limits of simultaneous articulability rather than any real change in what is articulable in principle. A future instrument with a larger cage may hold both the old and new frameworks simultaneously and see how they relate as partial articulations of the same underlying configurations.

3.6 POV-Dependent Articulation and Probabilistic Configurations

The account given in §3.1 through §3.4 describes a geometry in which a configuration has a determinate structure and the question is whether an instrument has sufficient resolution to articulate it. This geometry is adequate for a wide class of cases — the cases in which chaos is, as §3.4 argues, a gap between structure and resolution. But the qualification offered at the end of §3.4 must now be taken seriously. There appear to be domains in which configurations are not articulable as determinate in the sense just assumed — domains best articulated, on the accounts I borrow from the relevant sciences, as probabilistic: what can be said about them at any given moment is not that they have a hidden determinate pattern waiting to be resolved, but that they are most adequately articulated as a distribution over possible patterns rather than as a single one. I do not claim to establish, from my own observation, that such domains are probabilistic in their

being rather than in the best available articulation of them; I take the probabilistic reading from the sciences that have developed it (§6.2) and follow its consequences for the geometry. On that reading, widening the aperture does not, in such domains, replace probability with certainty; it articulates the probabilistic structure more precisely.

A reader raising a reasonable objection might say: if the configuration is probabilistic, then two cognizing entities observing the same configuration at different moments, from different positions, or with different observational goals will articulate different patterns — and this is evidence either that the patterns are arbitrary (against §2.3) or that no stable pattern exists (against the whole account). The objection has force only if we equate pattern with determinate configuration. Once we acknowledge that probabilistic configurations exist, a different resolution becomes available: the patterns articulated by different observers are not arbitrary, nor are they reducible to a single hidden pattern. They are pattern-POV pairs — real articulations of real aspects of the same probabilistic configuration, where which aspect becomes articulable depends on three parameters of the observing POV: when the observation is made, from where, and with what observational goal.

This does not collapse into constructivism. On the borrowed reading, the observer does not create the pattern: the configuration is articulated as having the probabilistic structure it has, and each POV articulates an aspect of that structure rather than imposing one. Nor does it collapse into naive realism, which would demand a single determinate pattern independent of any POV. What it does is extend the account of §3.1 through §3.4 to cover a class of cases the earlier sections set aside: cases where the configuration's structure is best articulated as probabilistic and where articulation is accordingly POV-dependent without being POV-arbitrary. The aperture still widens by extending the range of configurations an instrument can articulate — but in these domains, widening means extending the range of POV-pattern pairs the instrument can hold, not replacing probability with hidden determinacy.

The boundary between the two classes — configurations whose apparent chaos is a gap and configurations whose structure is probabilistic — remains, as §3.4 noted, unsettled by the present paper. What the present section adds is that, on either side of the boundary, the geometry of aperture and resolution continues to apply. Only the content of what is articulated changes: determinate patterns on one side, POV-dependent patterns on the other.

4. The Asymmetry: Cognition is Always Smaller

The features described in Section 3 have a structural consequence that deserves a section of its own.

4.1 The Pattern Space is Always Smaller Than the Configurations

The pattern space of any cognitive instrument is always smaller than the space of configurations that synthesis has generated. This is not a contingent fact about current instruments that could be remedied by further development. It is a structural fact about what it is to be an instrument.

Synthesis operates at every level of reality. It has been operating, by the most conservative estimate, for the entire history of the observable universe, generating configurations at every level continuously. The accumulated set of configurations that exist is vast — vast in a sense that exceeds any cognitive instrument's capacity to enumerate, much less articulate. Any instrument that articulates some of these configurations articulates a vanishingly small fraction. The instrument is not catching up to a fixed inventory. It is articulating a small region of an inventory that is itself continuously expanding.

4.2 The Self-Inaccessible Gap

A further consequence follows that is more uncomfortable. Some structural gaps in an instrument's aperture are not visible *from within the aperture itself*. The instrument cannot stand outside itself to see the shape of its own limits. It can notice the boundary of its aperture only at the points where it has approached the boundary and felt resistance. Boundaries that the instrument has never approached — because the procedures it possesses do not orient it toward them — remain invisible. The instrument does not know that it does not know, because the not-knowing is not within its pattern space.

This is the deepest asymmetry of the cognitive situation. An instrument is not merely smaller than the configurations available; it is, in part, structurally blind to the shape of its own smallness. A great deal of cognitive effort can be expended in completely good faith on the task of completing an aperture, without the effort ever encountering the gaps that lie in directions the instrument has no procedures to look in.

4.3 The Engine of Widening: A Note on Aviplestos

Aperture does not widen on its own. There is no spontaneous tendency in a cognitive instrument to extend itself further. The widening occurs because of a structural condition that operates not specifically within cognition but throughout reality, and that is described in detail in a companion paper. The condition is the structural tendency of every existing entity to lean toward configurations it does not yet occupy — designated, in the companion

paper, as Aviplestos (Huỳnh Mai Phúc, 2026b). Within cognition, this tendency takes the specific form of a directional lean toward configurations that are not yet within the pattern space — toward the boundary of the aperture and, where the gradient terrain permits it, beyond.

The present paper does not develop this condition; it notes only that it is the condition without which the geometry described here would be static. An instrument lacking the directionality would have the resolution capacity it had at the moment of its formation, and would never widen its aperture or extend its pattern space. The geometry would still apply, but it would describe a frozen instrument rather than one that develops over time.

5. The Plurality of Maps: Cognition as an Inter-Subject Phenomenon

The account of geometry given so far has described a single instrument in isolation. This is an idealization. There is no single cognition. There are many cognitions, one for each cognizing entity, and the relations among them constitute a structural feature of the cognitive situation that the rest of the paper has not yet addressed.

5.1 There Is No Single Cognition

A cognizing entity has its own cognition. Another cognizing entity has its own. The two cognitions are not parts of a single shared cognition; they are distinct configurations, located in distinct entities, with distinct histories of resolution development and distinct present apertures. This is not a philosophical claim that the paper undertakes to defend. It is an observation so basic that it is easy to overlook: there are many cognizing entities, and consequently many cognitions, and consequently many apertures and many pattern spaces.

The observation is consequential. Every claim made in Sections 3 and 4 about "the cognitive instrument" must be understood as a claim about *each* cognitive instrument — and the structural features of any one instrument coexist with the structural features of every other.

5.2 The Cognition of B as Part of the Reality A Articulates

From the point of view of any cognizing entity A, the cognition of any other entity B is *part of the reality that A is articulating*. A does not have access to B's cognition from the inside. A observes B's externalized cognitive output — speech, writing, behaviour — and treats it as a part of reality, subject to the same articulation procedures that A would apply to any other part of reality. This is a consequence of the structural position of cognition described in the companion paper on the Ontonoetic Pattern: cognition is a subset of reality, and the cognition of an entity other than oneself is a feature of reality from one's own point of view.

What is significant for the present paper is that the part of reality A articulates when A engages with B's externalized cognition is *itself an aperture* — an aperture different from A's own. When A reads B's writing, A is articulating, with A's own aperture, the residue of B's prior articulations made with B's aperture. The two apertures meet at the point of A's articulation of B's residue. They do not merge. They encounter one another across the externalized output that connects them.

5.3 Comparison as the Discovery Procedure for Self-Inaccessible Gaps

Section 4.2 noted that some structural gaps in an instrument's aperture are not visible from within the aperture itself. There is, however, a procedure by which such gaps can

become visible: *comparison with another aperture*. When A articulates the externalized output of B, and finds that B has articulated configurations A has not, A has discovered a region of the inventory that A's own aperture does not currently include. The discovery is not of the configurations themselves — A may still lack the resolution to articulate them as B does — but of *the existence of a gap A had not previously noticed*.

This procedure is not available to a single entity in isolation. An entity that has never encountered another entity's cognitive output can extend its aperture in directions that its own existing procedures orient it toward, but it cannot discover gaps that lie in directions its procedures do not orient it toward. Comparison is not merely a useful supplement to solitary cognition; it is the only procedure by which certain kinds of gaps can be discovered at all. The plurality of cognitions is not a regrettable feature of the cognitive situation that would be improved by unification. It is the structural condition under which a particular kind of cognitive growth becomes possible.

A clarification: the procedure does not deliver correspondence with reality. Two apertures comparing themselves do not collectively achieve a view from nowhere. They only locate gaps relative to one another. What lies beyond both apertures together remains structurally invisible to their combined inspection. Comparison expands the space of articulated configurations, but it does not exhaust it.

5.4 Immanent Objectivity Across the Network of Maps

A consequence follows for how the objectivity of cognitive output is to be understood. Within a single instrument, the question "is this articulation correct?" can be partially answered by the instrument's own operations of consistency-checking, prediction, and so on — but the deepest gaps remain invisible to the instrument's own self-inspection. Across a network of comparing instruments, a different and more robust kind of objectivity becomes available. An articulation that survives comparison with the articulations of many other instruments — each with its own aperture and its own gaps — is more robust than an articulation that has only been checked from within. This is not because the comparison reaches reality directly. It is because the comparison reduces a class of errors that would not be visible to any single instrument operating alone.

This is the inter-subject extension of immanent objectivity. The instrument and the configurations it articulates are not two independent entities requiring a bridge — the instrument is itself a part of reality, generated by the same processes that generated what it articulates. Across many instruments, this immanence becomes a network: many instruments, each immanent to the same reality, comparing their articulations and locating their respective gaps. The objectivity that results is structural rather than correspondence-based. It does not claim that any articulation matches reality as it is in itself. It claims that articulations which survive structural comparison across the network are less likely to

contain certain kinds of error than articulations that have only been checked from within a single instrument.

6. Three Illustrations

Three cases are offered here to illustrate the geometry developed in the preceding sections. The illustrations are not offered as empirical confirmations of the account in any falsifiable sense; the account is structural, and its relationship to historical cases is one of recognition rather than prediction. What each case provides is a point at which the geometry becomes visible in residues left by other cognizing entities or in well-known features of the world. The first illustrates a widening of resolution capacity — a configuration that became articulable when the aperture of available instruments extended to reach it. The second illustrates the distinction between chaos-as-gap and POV-dependent articulation, and the work that both do in domains where configurations are probabilistic rather than determinate. The third illustrates the comparison procedure by which self-inaccessible gaps in one instrument become visible through the pattern space of another.

A note on the provenance of the second and third illustrations. The case of sequential Stern-Gerlach measurement in §6.2 and the case of the Darwin–Wallace convergence in §6.3 were identified by an AI system during the composition of the present paper, as candidate illustrations of the structural points the paper had already articulated. I verified each case through subsequent reading before inclusion, and the descriptions in §6.2 and §6.3 are written in ordinary-language voice rather than as technical exposition. A reader with specialist knowledge of quantum mechanics or of the history of biology is invited to evaluate the mapping rather than take it for granted. The case of the microscope in §6.1, by contrast, is general historical knowledge I had before composing the paper.

6.1 The Microscope and the Cell

Before 1665, cells were invisible to every cognitive instrument in the world. A plant is a configuration of cells, a drop of pond water is a configuration of microorganisms, human tissue is a configuration of cells — all of these had existed as long as the organisms they constituted had existed, and none of them had been articulated. The configurations were fully real. They were also fully inaccessible, because no instrument yet developed had the resolution to bring them into articulable distinctness.

When Robert Hooke examined cork under a compound microscope and published the results as *Micrographia* in 1665, he observed and named a feature — the "cell" — that had been present in every cork stopper anyone had ever handled but that no one had been in a position to articulate. A little over a decade later, Antonie van Leeuwenhoek, using single-lens microscopes of unusually high quality for their time, observed what he called "animalcules" in rainwater, in human saliva, and in other familiar substances. The organisms were not new. The water from which Leeuwenhoek drew them had been drawn from the same sources people had drunk from for generations. What was new was the instrument, and the aperture it opened.

The case is a paradigm of §3.1 and §3.2: a widening of resolution capacity that extends the range of configurations the cognitive instruments of a period can articulate. Nothing changed in the configurations themselves. A cell had the structure it had whether anyone was looking or not, and whether anyone could look or not. What changed was the instrument — and with it, the pattern space within which the cognitive activity of the period operated. The history of biology after 1665 can be read as a long sequence of further aperture-widenings, each bringing a new class of previously invisible configurations into articulable distinctness: cell nuclei, mitochondria, ribosomes, DNA, individual proteins. At each step, the configuration had been there already. The cage grew larger; the configurations had been waiting inside it.

6.2 Quantum Spin Measurement

An illustration the AI system identified as a candidate case for the POV-dependent articulation discussed in §3.6 is the sequential Stern-Gerlach experiment in physics. The description below is offered in ordinary-language voice, on the strength of what I was able to verify through subsequent reading; physicists are better positioned than I am to evaluate whether the mapping holds.

The phenomenon, in ordinary description, is as follows. An apparatus exists that measures one property of a particle's spin — say, the spin along a vertical axis. The measurement returns one of two values. If one then measures the spin along a horizontal axis instead, the measurement again returns one of two values. So far this is unremarkable. What is remarkable is what happens if one measures the vertical axis a second time, after the horizontal measurement. One might expect the second vertical measurement to return the same value as the first. It does not, in general. The horizontal measurement appears to have displaced the prior vertical result, so that the second vertical measurement is again undetermined until performed.

The standard reading of this in physics is that the particle does not have a determinate spin along all axes simultaneously. There is no hidden complete specification of the particle's spin awaiting discovery; the particle has a probabilistic structure with respect to axes, and which axis is measured shapes which pattern becomes articulable. This reading is what makes the case an illustration of §3.6: on it, the configuration is read as probabilistic rather than as a gap in resolution, and articulation is POV-dependent in the sense that which aspect of the configuration becomes articulable depends on three parameters of the measurement setup — when the measurement is made, along which axis it is made, and what the measurement is for.

These three parameters are not about the observer's subjective state. Each is a structural feature of the observation setup. The case illustrates the two claims §3.6 makes in combination: that widening the aperture does not, in such domains, replace probability

with hidden determinacy; and that articulation is POV-dependent without being POV-arbitrary. Different measurement setups articulate different patterns of the same particle, and each pattern is a real feature of the particle's relation to that setup, not a construction imposed by the experimenter.

A reader trained in quantum mechanics will be aware that there is substantially more to say here — about Bell-type experiments, about the formal structure of measurement, about how the present reading relates to interpretive debates within physics. I do not undertake any of that. The illustration is offered for whatever it is worth as a candidate point of contact, identified through AI-assisted research and verified to the limit of my own ability to evaluate it.

6.3 Darwin, Wallace, and the Convergence of Maps

An illustration the AI system identified as a candidate case for the inter-subject comparison procedure discussed in §5.3 and §5.4 is the historical convergence between Charles Darwin and Alfred Russel Wallace on the mechanism of natural selection. The description below is offered as a candidate point of contact; readers familiar with the history of biology are better positioned than I am to evaluate the mapping.

The general outlines of the case, on the strength of subsequent reading: in 1858, Darwin received a letter from Wallace, then working in the Malay Archipelago, that contained an essay sketching essentially the same mechanism for the origin of species that Darwin had been elaborating privately for two decades — natural selection. Darwin had not yet published. Wallace had no access to Darwin's unpublished work. The two had been working, on opposite sides of the world, from different samples of the living world, with different intellectual backgrounds, toward a common configuration. The resolution adopted was a joint presentation of their work to the Linnean Society later that year, followed by Darwin's *On the Origin of Species* in 1859.

The case maps onto §5.3 and §5.4 in the following way. Two cognitive instruments — Darwin's and Wallace's — operated on substantially disjoint sets of observations and developed substantially disjoint pattern spaces, yet arrived at articulations that overlapped at the structural core. Neither had access to the other's aperture. What gave their articulation a kind of objectivity neither map alone could have provided was the fact that two independent instruments, each with its own gaps, resolved a common configuration at the points where their apertures happened to overlap. This is the immanent objectivity described in §5.4: not correspondence with an inaccessible reality, but structural coherence across a network of comparing instruments. The convergence does not establish that natural selection is true in some view-from-nowhere sense; it establishes that two instruments with different histories and different gaps could articulate the same

configuration, and that this is the kind of robustness comparison across instruments can produce.

7. The Map and the Territory: A Note on Metaphor

The account developed in Sections 3 through 5 invites comparison with the metaphor of map and territory familiar from general semantics and adjacent traditions. The metaphor is partially apt and partially misleading, and it is worth saying explicitly which is which.

The aspects of the metaphor that are apt: a map is smaller than the territory it represents; a map has scale, leaving out detail at any given level of representation; a map has regions of high detail and regions of relative emptiness; different maps of the same territory may be made by different cartographers and may disagree at points where they overlap. All of these features have analogues in the geometry of cognition described above: the pattern space is smaller than the inventory of configurations; resolution is the cognitive analogue of scale; some regions of an aperture are well-developed while others are sparse; different cognizing entities have different apertures and disagree at points where they overlap.

The aspect of the metaphor that is misleading: the classical use of the map/territory distinction often assumes a question of *correspondence* — does the map accurately represent the territory? — and a corresponding gap that demands to be bridged. The present account does not assume this question, and does not attempt to answer it. The pattern space is not a representation of an inaccessible territory that the cognizing entity is straining to reach. The pattern space and the configurations it articulates are both part of the same reality, and the entity articulating them is itself part of the same reality. There is no gap of the kind that the correspondence framing posits, because there are no two separate entities — mind on one side, world on the other — that need to be brought into relation. There is one reality, and within it there is articulation.

The map/territory metaphor is therefore offered here as an aid to intuition rather than as a theoretical framework. A reader who finds the metaphor helpful for grasping the structural features of cognition described in Sections 3 through 5 is welcome to use it. A reader who, in using it, begins to ask questions about the accuracy of the map relative to the territory is using it past the point at which it is reliable, and should set it aside.

8. Relation to Other Components of the Programme

The present paper presupposes the Synthetic Principle (Huỳnh Mai Phúc, 2026a) for its account of patterns as synthetically generated configurations. Synthesis is the universal mechanism by which configurations are produced; the present paper takes the products of synthesis as given and describes the geometry within which a cognitive instrument articulates them. The present paper does not subsume the Synthetic Principle, and the Synthetic Principle does not subsume the present paper: the first describes what is generated, the second describes the structural features of an instrument's encounter with what has been generated.

The present paper presupposes Aviplestos (Huỳnh Mai Phúc, 2026b) for the directional condition under which cognitive apertures widen over time. Without Aviplestos, the geometry described here would be static. Aviplestos is not developed in the present paper; it is registered in Section 4.3 as the directional condition that animates the geometry. The geometry would still apply to a frozen instrument; Aviplestos is what ensures that instruments are not, in fact, frozen.

The present paper presupposes the Ontonoetic Pattern (Huỳnh Mai Phúc, 2026c) for its account of the cognitive procedure by which articulation is performed. The Ontonoetic Pattern describes the three-function mechanism of observation, description, and naming that constitutes any single act of articulation. The present paper takes that mechanism as given and describes the structural features of the space within which the mechanism operates. The two papers do not overlap, do not compete, and are not derivable from one another. The first describes what a cognizing entity *does*. The second describes the *shape* of what the entity does it within.

9. Conclusion

9.1 Summary

This paper has described the structural geometry of cognition in a cognizing entity. It has set aside naive realism and constructivism in favour of an account in which patterns are synthetically generated configurations existing independently of any observer, and in which cognition articulates rather than detects or constructs. It has introduced the notions of resolution capacity, aperture, and pattern space as descriptions of the geometric features of any cognitive instrument. It has argued that what is conventionally called chaos is in most cases a description of the gap between a configuration's structure and the resolution of the instrument attempting to articulate it. It has noted the limit on simultaneous articulability — the cage — that constrains how much of an aperture can be held at once. It has developed the structural asymmetry between any cognitive instrument and the configurations available, and has identified the self-inaccessible gap that no single instrument can detect from within itself. It has introduced the inter-subject dimension: there are many cognitions, not one, and the comparison of cognitions across the network of cognizing entities is the procedure by which gaps invisible to any single instrument become visible. It has noted the relation between this account and the metaphor of map and territory, and clarified why the metaphor must be used with care.

9.2 The Paper as an Instance of Its Own Subject

The paper is itself a cognitive output produced by a single cognitive instrument with a particular aperture, particular gaps, and particular limits of simultaneous articulability. It is, in the terms of Section 5, one map among many. A reader who finds aspects of the present account that the author has not articulated, or who locates structural gaps in the geometry described here that the author has not noticed, has thereby performed exactly the inter-subject discovery procedure that Section 5.3 describes. The paper does not regret this. It invites it. The geometry of cognition is not the kind of thing a single instrument completes. It is the kind of thing a network of comparing instruments approximates over time, and the present paper is offered as one contribution to that network.

References and Convergences

Programme Components

Huỳnh Mai Phúc. (2026a). *The Synthetic Principle: An Observation of the Mechanism by Which Discrete Elements Generate Irreducible Configurations.* Working Paper. https://doi.org/10.57967/hf/11444

Huỳnh Mai Phúc. (2026b). *Aviplestos: The Structural Tendency Toward the Not-Yet.* Working Paper. https://doi.org/10.57967/hf/11444

Huỳnh Mai Phúc. (2026c). *Ontonoetic Pattern: The Mechanism by Which a Cognizing Entity Articulates Reality.* Working Paper. https://doi.org/10.57967/hf/11444

Huỳnh Mai Phúc. (2026e). *The Passage of Becoming: An Observation of How the Classification of Configurations Is the Trace of the Mechanism's Passage Through the Regions of Existence, Cognition, Consciousness, and Reflection.* Working Paper. https://doi.org/10.57967/hf/11444

Points of Ontological Convergence

The works listed below are not foundations on which the framework was built, but points at which the completed articulation was found to converge with the thought of others — identified and compared only after the theoretical framework was complete.

Darwin, C. (1859). *On the Origin of Species by Means of Natural Selection.* John Murray.

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