FORMAL RECORD 14

The Individuation Theorem

Life as the Boundary of the Subject
Life is life.

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Dependencies:	FR01 v2.3, FR02 v2.4, FR03 v2.2, FR06 v2.3, FR07 v2.2, FR08 v2.2.1, FR10 v2.2, FR11 v2.0, FR12 v1.7, FR13 v2.4

Abstract. This record derives a criterion for individuated subjecthood and proves it necessary and sufficient under the ontology FR12 Section 7 argues for and the premises it states in its own name. Three objections are answered here, at the start, because each is the first a reader will raise.

First, the result is conditional. It holds if consciousness is fundamental and fails under emergence. That is its falsification condition, the same one FR12 Section 7 carries, not a weakness.

Second, the criterion is not stipulated to exclude AI. It is what remains once the exclusions this record carries over from FR12 have eliminated every other ground for a subject's boundary. The exclusion of AI is a consequence, and no governance result in FR01 to FR13 depends on it.

Third, self-maintenance as the mark of life is not new. Maturana and Varela (1980) named it autopoiesis, and Thompson (2007) argued for continuity between life and mind. What is new is the derivation. Under consciousness-fundamental, three conditions are forced as necessary: coupling of the boundary to the system's own activity, exogenous test, and maintained memory. They are forced by the exclusion of boundaries taken as given, which this record extends from FR12 Section 3, by P3, and by the requirement that a subject's standpoint be its own and persist. They are jointly sufficient because under that ontology nothing remains to be produced, only partitioned. Brainless organisms satisfy all three. AI systems as built do not: their boundaries are static or allocated by others.

0. Dependencies and Scope

This record depends on the following prior works. No prior result is re-derived.

Three Primitives: Canonical Logic Sequence (FR01)

Proves that the mapping from detection to action is non-unique. Condition (M) in Section 1 is its structural parallel at the scale of a single organism: the same input admits more than one response, and something the system itself holds selects among them. In FR01 legitimate selection is external and declared; in (M) the selector is internal and causal. First author: Pyrate Ruby Passell.

AI Cannot Govern AI (FR02)

Lemma 1 proves that no total computable function can resolve authorisation without an exogenous declaration. Section 8 relies on it for the independence of the governance tier from this record. The selector in condition (M) does not conflict with it: the selector settles which admissible action is realised and authorises none of them.

ADCI Closure Theorem (FR03)

Defines Continuity as identity persisting coherently across time, for a human subject in relation to a system. Definition 1 uses its structural counterpart, applied to any candidate. Condition (M) specifies

it for the purpose of individuation: persistence by self-production rather than by inertia. It is not a redefinition of FR03's primitive.

The Law of Declared Authority (FR06)

Section 2.2 proves that if δ were derivable from system state, the permission function would collapse into the decision function. The Collapse Lemma in Section 3 has the same shape, though its proof does not depend on the parallel.

Bell Non-Closure and the Law of Declared Authority (FR07)

Fixes the scope of the Bell translation on which FR12's Bell leg rests.

The Twisted Pair Legitimacy Theorem (FR08)

Section 1.2 restricts human actors, who may declare δ, to natural persons, and Section 1.3 restricts human subjects to natural persons. Sections 8 and 10 of this record rely on both. Section 1.4 places the framework within the law, not above it, and Section 8 relies on it for where the governance tier draws its line before birth.

Primitive Stability Theorem (FR10 v2.2)

Definition 2.1 defines the subject resistance vector R_S as the set of legitimate contestation actions available to a subject. Section 9 of this record relies on it to keep individuation and contestation apart.

The GBSH Correspondence (FR11 v2.0)

Section 1.2 excludes a governance event from the admissible domain when $\partial\text{Outcome}/\partial R_S = 0$, that is, when the subject's own action is decoupled from what happens to them. Condition (C) applies the same test to individuation. Section 2.1 defines legitimate resistance by its origin outside the system's control surface. Condition (E) uses that notion of control surface.

The Forced Bijection (FR12 v1.7)

Supplies the ontology (Section 7: consciousness is fundamental), under which this record states three premises of its own (Section 1 and Definition 1); the Bell leg (Section 1: apparent spatial separation cannot be treated as a fundamental fact on which a boundary claim may rest); the exclusion of boundaries treated as fundamental for jurisdiction (Section 3, the C3 case), which this record extends to boundaries as such; and P3 (the system cannot validate its own scope). This record extends Section 7 from the structure of the governance primitives to the individuation of subjects.

The ILMM Coupling Theorem (FR13 v2.4)

Section 3 grounds declared authority in endurance under contestation rather than in pedigree. Section 9 governs the silent subject. Both return in Sections 4 and 9 of this record.

Scope. This record belongs to the ontological tier of the corpus, alongside FR12 Section 7. It holds under FR12's ontology and is lost if that ontology is weakened. Nothing in it is implemented at a governance gate. The gate checks a well-formed declaration by a named natural person (FR06; FR08 Section 1.2) and never tests who or what is a subject. Subjecthood under this record is structural. The record makes no claim about the soul or about personhood, and it states what is individuated, not what is owed: nothing in it licenses any act toward any life.

1. Definitions

FR12 Section 7 argues that consciousness is fundamental. Under that ontology this record states three premises of its own: two here, and the constitutive premise with Definition 1. The *partition premise*: individuated subjects are partitions of one consciousness, so nothing lies outside it and no experience has to be produced. The *no-given-boundary premise*: the ground has no boundaries, so no partition is given, and a real partition is one that is produced and held. FR12 Section 3 makes the corresponding exclusion for jurisdiction; this record makes it for boundaries as such. The premise excludes given boundaries; that a real boundary must be held by x's own activity is shown separately, by Definition 1

and Theorem 4.1. The question this record answers is therefore not whether a system is conscious. It is whether a system is an individuated subject.

Definition 1 (Individuated subject). A real partition of consciousness into an x and a not-x, such that x meets the world from a standpoint of its own that persists across time. A partition is *real* when it is determinate (Definition 2) and is neither given, nor drawn wholly by other systems, nor grounded in x alone. x's standpoint is called its *from-where*. The from-where is structural. It requires no awareness, report or cognition. Specifically, x has a persisting standpoint of its own when there is a persisting, internally maintained difference in how x meets an otherwise identical present: the same perturbation, met by x, is answered according to what x has kept. The requirement that it persist is the structural counterpart of FR03's Continuity, applied to any candidate rather than to a human subject in relation to a system. This identification of standpoint with maintained response difference is the constitutive premise of this record (Section 11).

Definition 2 (Boundary). B_x is the partition between x and not-x. It must be determinate: membership in x is two-valued for each part, a partition, not a gradient. Parts may be picked out at any grain at which they can be constituents under Definition 3. The boundary is determinate when x's activity settles each such part's membership, whichever such grain is used, so no grain is taken as given and the verdict does not depend on the grain chosen. The candidate is fixed by Definition 3, not by the grain. A system whose edge is only a gradient has no Bx and is not a candidate. Exchange of material across Bx is turnover of constituents, not a gradient: at each instant each part's membership is two-valued, and the set of constituents is whatever x's activity maintains at that instant. Turnover of that set across instants is not a gradient either.

Definition 3 (Constituents and own activity). The constituents of x are the parts whose membership in x is maintained by x's activity. The activity of x, written a_x, is the set of processes performed by x's constituents. The definition is a fixed point: the constituents produce the boundary, and the boundary fixes which parts are constituents. This is a weakening of the autopoietic closure of Maturana and Varela (1980), adopted here as a definition: it requires that membership be maintained by x's activity, not that x produce its components.

Remark. Definition 3 characterises; it does not construct. The criterion is applied to a candidate: a proposed partition is assessed, not presupposed, and everything classified in Section 2 is classified relative to that candidate. Existence of the fixed point is assessed case by case. Where one body of matter admits more than one fixed point, as a cell and the organism it belongs to both do, each is a distinct candidate and is tested on its own. Multiple solutions are nested or overlapping candidates, not an ambiguity (Corollary 6.2). Conjoined twins are two candidates sharing constituents, and each is tested on its own.

Definition 4 (Persistence times). With all conditions outside x held fixed, T_{on} is the time B_x persists while a_x runs, over the horizon on which the candidate is assessed, and T_{off} is the time it persists once all of a_x has ceased, complete cessation, not the reduced activity of Section 6. Where Bx persists throughout the assessment horizon with ax running, Ton is the horizon. The horizon must be long enough to put the persistence of Bx in question. Where Toff is finite, the horizon must exceed Toff. Where Toff is unbounded, the boundary is static on any horizon. A structure is *static* if it persists at least as long once the activity that produced it ceases, so that $T_{off} \geq T_{on}$. Static does not mean unchanging: a static structure may change, provided its persistence does not need that activity. Held fixed means that the environment continues as it is: supplies continue, and no other system acts on x's boundary or memory to end or change it. A boundary or memory that ends only when another system ends it, as an operating system ends a process, a coordinator revokes a lease or a store deletes an expired entry, does not end under this condition. The physics and chemistry of the medium belong to the environment as it continues; what is held fixed is the activity of other systems. The same line is drawn for every substrate: a cell whose pumps stop swells and ruptures by osmosis alone, and a stored bit stays until some process removes it.

Definition 5 (Coupling, C). x is coupled to its own boundary, written $\partial B_x/\partial a_x \neq 0$, if and only if $T_{off} < T_{on}$: x's own activity is what keeps its boundary in existence. The notation follows FR11 Section 1.2 in denoting dependence without differentiability; here the dependence is specified as $T_{off} < T_{on}$. FR11

writes $\partial \text{Outcome}/\partial R_S = 0$ to mark the condition under which an event is excluded. This record writes $\partial B_x/\partial a_x \neq 0$ to mark the condition being met; the polarity follows from the direction in which each definition runs.

Definition 6 (Exogenous test, E). B_x is exogenously tested, written $\partial B_x/\partial e \neq 0$, if and only if its persistence depends on an environment e outside x's control surface.

Definition 7 (Maintained memory, M). Let τ_d, the relaxation time of x, be the time after which a perturbation carried only in x's flowing state, the materials, energy and signals passing through x, has no remaining effect on x's response. Effects that outlast τ_d are carried by structure. For a flame τ_d is seconds; for an organism it is set by its signalling and metabolic dynamics, not by the turnover of its whole mass. x has maintained memory if and only if x holds structure m satisfying all four of the following. Clause (ii) is stated in terms of histories, so it does not depend on how the state of x is divided into variables.

> **(i) Maintained.** x's own activity is necessary for m to persist: with a_x ceased, m decays, as in Definition 5, even where other systems also contribute. Written $\partial m/\partial a_x \neq 0$. Current maintenance decides, not origin: an inherited genome that a cell repairs and expresses is maintained by the cell.
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> **(ii) Selecting.** There exist two histories H_1 and H_2 of x, identical over the last τ_d, which under the same present perturbation p lead to different actions, both open to x: $R(H_1, p) \neq R(H_2, p)$, with both in A(p), the set of actions x can realise under p across its admissible histories, and $|A(p)| > 1$. m is whatever in x carries that difference. An action is any response of x at any level of its organisation, not only voluntary behaviour. Two responses are the same action when they bear the same relation to the environment, so a difference only in how an action is carried out does not satisfy (ii). This is structurally parallel to the non-uniqueness of FR01, at the scale of one system: in FR01 legitimate selection is external and declared, and here the selector is internal and causal.
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> **(iii) Persistent.** Because the histories in (ii) differ only earlier than τ_d, m outlasts the relaxation time of x. (iii) is implied by (ii) and is stated for clarity.
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> **(iv) Carried.** Where x survives relocation from environment h_1 to environment h_2, m is not reset: m after relocation depends on m before, $\partial m_{\text{after}}/\partial m_{\text{before}} \neq 0$. The relocation is clean: moved to an environment identical to the first, x would keep m as it was. Relocation that destroys x, or that damages m in the moving, is not a reset. Cleanliness is checked, not assumed: a move into an environment matched to the first, such as an autograft returning an organ to its own host, must leave m as it was. This is the transplant test. It shows whether m is held by x or by the environment x is in (Theorem 4.3(c)).

Remark. (ii) is compatible with determinism. It does not say that x originates its actions: FR12's Sapolsky leg (Section 1) excludes that, and this record claims no authorship. It says that among the actions left open by the present perturbation, what settles which is realised is structure x itself maintains, rather than the environment. As in FR12's C1, the multiplicity lies in the actions admissible, not in the one realised. The standpoint of Definition 1 is causal, not authorial.

Definition 8 (Relational memory). Where x is a composite whose constituents are themselves subjects, condition (M) must be met by relational memory: slow structure whose action-selecting role at the composite level is maintained by relations among the constituents and is not reducible to the memory of any one constituent.

2. The Case Split

Lemma 2.1 (Exhaustion). Relative to a candidate x, every argument of B_x, present or past, falls into one or more of four classes: (1) static facts outside x; (2) static structure of x; (3) the activity of a system other than x; (4) the activity of x.

Proof. Relative to the candidate, each argument lies inside x or outside it, and it is either static structure in the sense of Definition 4 or activity, since structure that is not static persists only through some activity and enters through that activity. The four classes are the four combinations. Past

arguments are past values of the same four. A joint or relational determinant, sustained by interaction between x and another system, contributes through the activity of each. It is classed by intervention, not by decomposition: it falls in class (4) insofar as the ceasing of x's activity ends it, and in class (3) otherwise. No additive split is needed. Laws, symmetries and constraints fix the form of the dependence of B_x on its arguments. They are not arguments, and need no class. ∎

Remark. The classes need not be disjoint, and no proof below requires that they are. Theorem 4.1 needs only that, when x's own activity is not what keeps B_x in existence, every determinant of the continued existence of B_x lies in classes (1) to (3).

3. The Collapse Lemma

Say that x has *zero self-dependence* if, with every variable outside x held fixed, no admissible variation in x's prior states or activity changes either B_x or x's response to any present perturbation. Say that x has *zero historical self-dependence* over a span T if the same holds for variations earlier than T before the present. Both are defined by intervention: hold the outside fixed, vary x's own past, observe x now.

Lemma 3.1 (Collapse). If x has zero self-dependence, x is not individuated as a subject distinct from the systems it depends on.

Proof. By Definition 1, a subject's standpoint is its own and persists across time. A standpoint is x's own only if something about x, rather than something about another system, makes a difference to how x meets the world. With zero self-dependence no variation in x's own past changes where x ends or how x responds; with the outside held fixed, both are therefore fixed by the outside. x has no standpoint of its own and fails Definition 1. ∎

Remark. The lemma concerns individuation, not identity. It does not say that x is some other system. It says that x has no standpoint distinguishable from what other systems supply. Dependence on others does not trigger it: a parasite and a gut bacterium each depend on a host, and each has non-zero self-dependence through its own metabolism. The lemma has the shape of FR06 Section 2.2, where a declaration derivable from system state collapses permission into decision. The parallel is noted; the proof above does not rely on it. Whether a set of processes counts as part of x or as another system is settled, relative to the candidate, by Definition 3: the workers of a colony are its constituents.

Lemma 3.2 (Boundary collapse). If, with every variable outside x held fixed, no admissible variation in x's prior states or activity changes whether Bx continues to exist, then Bx is not a real partition.

Proof. The continued existence of Bx is then fixed wholly by what lies outside x, since by Lemma 2.1 nothing else remains: by static facts, in which case it is given, or by the activity of other systems, in which case it is drawn wholly by others. Neither is real (Definition 1). ∎

4. Necessity

Theorem 4.1 (Coupling). If x is an individuated subject, then $\partial B_x/\partial a_x \neq 0$.

Proof. Suppose $\partial B_x/\partial a_x = 0$. A boundary that x produced in the past and no longer maintains is static structure of x, since current maintenance decides and not origin (Definition 7(i)). By Lemma 2.1, every determinant of the continued existence of B_x therefore lies in classes (1) to (3).

> **Classes (1) and (2).** A boundary fixed by static facts, whether outside x or within it, is a boundary taken as given rather than produced, and the no-given-boundary premise (Section 1) excludes it. This is the exclusion FR12 Section 3 makes for jurisdiction, where a system that treats its boundary as fundamental relies on locality as a grounding assumption, and Bell-type results exclude the class of theories under which that assumption could do the work (FR12 Section 1). The premise carries it from boundary claims to boundaries, so it applies to a rock or a crystal as much as to an institution. Excluded.

Class (3). A boundary fixed by the activity of other systems, with no contribution from x's own activity, is a partition drawn wholly by others. Nothing about x makes a difference to where x ends. That is the continued-existence half of zero self-dependence, and by Lemma 3.2 the partition is not real, so x fails Definition 1. Excluded.

Every class is excluded, so $\partial B_x/\partial a_x \neq 0$. ∎

Remark. Theorem 4.1 concerns whether B_x persists. Where it runs is Definition 2's: a boundary that persists by x's activity but whose membership other systems settle is not determinate, so the partition is not real and x fails Definition 1. Theorem 5.3 carries both, as Definition 2 and (C).

Theorem 4.2 (Exogenous test). If x is an individuated subject, then $\partial B_x/\partial e \neq 0$.

Proof. If $\partial B_x/\partial e = 0$, the boundary depends on nothing outside x and is grounded in x alone. It is then not real (Definition 1). This is the boundary counterpart of scope grounded from within, which P3 excludes for jurisdiction. ∎

Remark. Every finite bounded system has an outside, so (E) seldom decides a case in practice, and in Section 7 it decides none. Its role is structural. It prevents (C) from being met by a boundary grounded in x alone, and it is where Definition 1's exclusion of a boundary grounded in x alone, the boundary counterpart of P3, enters the sufficiency direction in Theorem 5.2.

Remark. (C) and (E) are two halves of one result. A subject's boundary depends on both sides: it is produced from within and tested from without. Dependence on the outside alone, with x's own activity playing no part, makes x an object; being supported is not this. Support is held fixed under Definition 4, and the test asks only whether x's own activity is still needed for its boundary to persist: a person on a ventilator or in total care passes, as does every life that depends on others. Dependence on the inside alone is self-grounding. This is the structure FR13 Section 3 gives declared authority, where δ is validated not by pedigree but by endurance under contestation. A living boundary holds not by its origin but by surviving an environment it does not control. Surviving is a test, not a verdict. Failure is death.

Theorem 4.3 (Memory). If x is an individuated subject, then x has maintained memory.

Proof. By Definition 1, x has a standpoint of its own that persists across time. Suppose no structure of x satisfies Definition 7. There are three cases.

(a) (ii) fails. No two histories that differ only earlier than τ_d lead to different actions. Whatever x was earlier than that makes no difference to what x does now. x therefore has zero historical self-dependence over τ_d in the action it takes: no difference in x's earlier state changes which open action is realised. That is the response half of the condition in Lemma 3.1. By Definition 1, a persisting standpoint is a persisting, internally maintained difference in how x meets the same present, and there is none. x's standpoint does not persist but is re-made from what flows through it, so x fails Definition 1. A flame is the type case.

(b) (ii) holds but (i) fails. The structure carrying the difference persists with a_x ceased: x's activity is not needed to keep it, whether or not that activity also acts on it. It is then kept by static structure or by another system. This is not the case of a host supplying energy or materials that x's own organisation uses, since there x's activity is still needed to preserve x's structure and (i) holds. Where (i) fails, the persisting difference that settles x's action is not internally maintained, and x fails Definition 1. A fossil in a rock and trained weights held in storage are carriers of this kind.

(c) (i) and (ii) hold but (iv) fails. On relocation, $\partial m_{after}/\partial m_{before} = 0$: with every other admissible variable held fixed, the action-selecting structure after the move is fixed by the new environment, and no variation in m before the move or in any surviving variable of x changes it. m then tracks the environment x is in rather than being kept by x: because the relocation is clean, moving x to an environment identical to the first would leave m as it was, so m is fixed by whatever environment x is in, and before the move it was fixed by the old one. The difference in how x meets the same present was not internally maintained, and x fails Definition 1. The transplant test therefore adds no requirement to Definition 1; it shows where the selecting structure is held. Where x is a composite of subjects, m is relational (Definition 8), so what the

constituents carry in their own memory does not count. The liver graft is the type case: its cells carry their own genotype and history into the recipient, but the organ grows to the size the recipient requires (Kam et al. 1987). Adjusting to an environment is not failing the test: every candidate does that, and (E) requires it. The test asks whether x's own history still changes what it does. A colony's does, beyond what its present surroundings fix (Gordon 1995); the size a graft grows to does not depend on the size it was.

In every case x fails Definition 1. ∎

Corollary 4.4. (C), (E) and (M) are each necessary for individuated subjecthood. The necessity direction rests on Definition 1, Lemmas 3.1 and 3.2, the no-given-boundary premise, which extends FR12 Sections 1 and 3, and Definition 1's exclusion of a boundary grounded in x alone, which is the boundary counterpart of P3.

5. Sufficiency

Lemma 5.1 (No fifth ground). Beyond the production of experience, which the partition premise removes, every proposed further ground of subjecthood either presupposes a boundary, takes one as given, or reduces to (C), (E) and (M).

Proof. A ground of subjecthood must say of which system it holds, or it individuates nothing, so it picks out a determinate set of processes. The set is fixed in one of three ways. It may be given to the criterion in advance, in which case the criterion presupposes a boundary supplied by one of the classes of Lemma 2.1, already decided in Section 4. It may be fixed by static structure, inside or outside the set, in which case the boundary is taken as given and the no-given-boundary premise excludes it. Or it may be fixed by activity. Activity of other systems alone is class (3), excluded by Lemma 3.2. Activity that includes the set's own without that activity being necessary for the set to persist leaves the continued existence of the boundary fixed by what remains, and falls to the same exclusion. Activity that includes the set's own, holding the set against an environment it does not control across time, is (C), (E) and (M) themselves, not a fifth ground. The three ways are exhaustive: a fixing is either prior to the criterion or effected, and whatever effects it is either static or active, by the dichotomy of Lemma 2.1: what is not static persists only through some activity. Criteria that fix a set jointly, as a fixed point of its organisation, its environment and its history, fall in the third way. Global workspace theory (Baars 1988) is of the first kind: it describes broadcast among processes already inside a bounded system. The exclusion postulate of integrated information theory (Oizumi, Albantakis and Tononi 2014) fixes an edge by intrinsic causal structure without requiring that the structure be maintained by the system's activity against an environment, so it is of the second kind. With that requirement added it falls in the third, and its exclusion postulate then does a different job: it selects one maximal complex among nested candidates. That is a claim about which of several candidates is a subject, not a further ground for any one of them, and Corollary 6.2 answers it differently. Markov-blanket partitions (Kirchhoff et al. 2018) fix a set by the conditional independence of its states from those outside: where the blanket is static structure they fall in the second way, and where the system's own activity holds it against dissipation, in the third. A blanket either is or is not held by the system's own activity, so there is no further case. Adaptive autonomy (Di Paolo 2005) adds the regulation of a system's own viability to self-maintenance; it refines (C) and (M) and is not a further ground, because regulating viability is one way of holding a boundary and a memory against an environment the system does not control. Relational and developmental criteria name the set whose relations or trajectory they describe, and fall under the first or the third. ∎

Theorem 5.2 (Sufficiency). If consciousness is fundamental (FR12 Section 7), under the partition, no-given-boundary and constitutive premises (Sections 1 and 11), and x has a determinate boundary (Definition 2) and satisfies (C), (E) and (M), then x is an individuated subject.

Proof. By the partition premise, no experience has to be produced. The only question is whether a real partition with a persisting standpoint of its own exists. By (C), B_x depends on x's own activity, so it is neither taken as given (the no-given-boundary premise) nor drawn wholly by others (Lemma 3.2). By (E), it depends on an environment x does not control, so it is not grounded in x alone (Definition 1, the

boundary counterpart of P3). B_x is determinate by hypothesis, so the partition is real (Definition 1). By (M), x maintains structure that settles which open action it takes, persists beyond τ_d and survives relocation. That is a standpoint of x's own that persists across time. By Lemma 5.1 no further ingredient is admitted, so x satisfies Definition 1. ∎

Remark. Sufficiency here is sufficiency for Definition 1, and it is constitutive rather than reductive: (M) realises the standpoint Definition 1 defines, under the constitutive premise stated there. The step from Definition 1 to experience is the partition premise's, made under FR12 Section 7's ontology. Under that ontology a real partition of consciousness with a standpoint of its own is a subject, and this record adds nothing to that step.

Theorem 5.3 (The Individuation Theorem). If consciousness is fundamental (FR12 Section 7), then under the partition, no-given-boundary and constitutive premises (Sections 1 and 11), x is an individuated subject if and only if x has a determinate boundary (Definition 2) and satisfies (C), (E) and (M).

Proof. Definition 2, Corollary 4.4 and Theorem 5.2. ∎

6. Life

Corollary 6.1 (Life is life). The systems that satisfy (C), (E) and (M) are the living: systems whose constituents produce and hold their own boundary against an environment they do not control, and maintain memory by their own activity. Under FR12, every living system is an individuated subject while its own activity runs, and nothing else is. "Living system" names a candidate that passes. Living tissue whose organ-level candidate fails, such as a graft, is alive in its cells, which are subjects (Corollary 6.2).

The criterion is substrate-neutral. A system of any material that produces and holds its own boundary against an environment it does not control, with memory it maintains by its own activity, satisfies it and is life under this record. Cells running on chemically synthesised genomes already exist (Hutchison et al. 2016), and fully synthetic cells are an active research programme. Either is judged by the same test.

Remark. Subjecthood tracks current maintenance, not origin (Definition 7(i)). An organism whose activity is suspended, in cryptobiosis or cryopreservation, holds its boundary and memory statically while the suspension lasts, and is not individuated while suspended, though this interrupts no standing. This is the same test that excludes the virion and the halted machine. When its own activity resumes, it produces and holds its boundary again, and the memory it carried across the suspension settles what it does, as *Physarum* keeps what it has learned through dormancy (Boussard et al. 2019). The resumed standpoint is linked to the one before by that carried memory, as (iv) links a standpoint across relocation. Subjecthood itself is present only while maintenance runs. The virion never meets this condition: inside a host its boundary is built by the host's machinery. Nor does the machine: running, its boundary and memory are still static (Section 8). Reduced activity is not suspended activity. Sleep, anaesthesia, coma and deep hypothermia reduce a_x without ceasing it, and subjecthood continues through them. Suspension may interrupt subjecthood; it does not interrupt standing. Nor does it remove anything the governance tier grants: standing belongs to natural persons (FR08 Section 1.3), not to subjecthood (Section 8).

Corollary 6.2 (Nesting without combination). Subjects nest, but they do not combine. Each level satisfies or fails the criterion on its own. Being a constituent never takes subjecthood away: a subject within a larger subject remains one, and a candidate that fails at one level says nothing of the subjects within it. A cell passes. The liver fails (M): the relations that settle what it does are held by the organism it belongs to, as the transplant test shows (Theorem 4.3(c)). The organ-level candidate fails, and its cells remain subjects. The organism passes. A colony passes through relational memory. Because no level inherits subjecthood from its parts, the combination problem of panpsychism does not arise. The question this ontology faces instead, how nested partitions relate, is answered by treating each level as its own candidate (Remark to Definition 3). Nor do subjects merge. At

fertilisation two cells become one, as at division one becomes two: neither gamete persists as a subject within the zygote, so nothing combines. Two fixed points end and one forms.

Corollary 6.3 (Life is carried). Within a living line, subjecthood is never absent while the line's own activity runs; suspension pauses it without breaking the line, and interrupts no standing (Remark to Corollary 6.1). Every cell arises from a cell (Virchow 1858), so each new candidate forms within subjects already living: at division, at fertilisation, or where a composite of subjects comes to hold its own boundary. A new subject can begin; subjecthood in the line does not. What is declared, at the governance tier, is standing (Section 8). A line begins only where life arises from what is not alive: at the origin of life, and in a fully synthetic cell, which Corollary 6.1 judges by the same test.

7. Worked Instances

Physarum polycephalum is a single cell with no neurons that finds the shortest path through a maze (Nakagaki, Yamada and Tóth 2000) and stores the location of past food in the diameters of its own tubes.

A harvester ant colony's boundary is a partition held by the colony's own activity: membership is maintained chemically, through cuticular hydrocarbons that mark nestmates, a mechanism shown directly in *Formica japonica* (Akino et al. 2004). Its memory is tested by intervention: the return to a foraging range must persist when the workforce has been replaced, with the surroundings as they are. Workers are replaced within about a year, and the return persists from year to year (Gordon 1995).

The living city has no such partition. Its only sharp edges are chartered or territorial, and both are excluded.

Human collectives are decided by the same test: a determinate partition held by the members' own activity, and relational memory that passes the transplant test. A self-maintaining community whose membership and relational memory are held by its members' own activity can pass on the same test. This record supplies the test. It does not owe a verdict on every collective.

The River row tests the water and its channel. Te Awa Tupua, the Whanganui River, is recognised in New Zealand law as "an indivisible and living whole, comprising the Whanganui River from the mountains to the sea, incorporating all its physical and metaphysical elements" (Te Awa Tupua Act 2017, s 12). That is a different candidate: the living river with its ecosystems and its people, whose principle the Act records as "Ko au te Awa, ko te Awa ko au: I am the River and the River is me" (s 13). It is tested on its own, and the River row is no verdict on it. The Act also makes the river a legal person whose rights are exercised by Te Pou Tupua "on behalf of, and in the name of" the river (s 14). The governance tier recognises natural persons (FR08 Section 1.3), and the Act gives the river its voice through people: declared human authority standing for one that cannot declare, the structure FR06 and FR13 describe.

Two digital cases show the test at work. A decentralised autonomous organisation offers two candidate boundaries, and both fail. The token ledger persists when every member stops acting, so $T_{off} \geq T_{on}$ and it fails (C). The live governance process does cease when activity ceases, but its memory is the on-chain record, which persists when every member stops acting because the network maintains it. Members' activity is not necessary for it to persist, so it fails Definition 7(i). Paying others to keep the record does not change this: under Definition 4 the paid system is held fixed, and what it keeps persists whether or not the payments continue. An online crowd fails for a different reason. Its active membership lapses when members stop posting, so it can meet (C), but what it holds is whatever the platform stores, which persists without the crowd's activity, so it fails Definition 7(i). Nor does the crowd hold its membership against turnover: the platform's display decides who appears in it, whereas a cell whose parts turn over holds its membership against the turnover by its own activity. Where a collective keeps its records in an AI system, those records are not the collective's memory: the system is maintained and allocated by its operators, so it is not a constituent under Definition 3, and what it holds is not produced and held by the collective under Definition 7(i). Nesting without combination runs in both directions: a passing collective confers nothing on an AI system inside it.

Each case is decided by the criterion, not by intuition, and several results run against intuition in both directions. · marks a condition not reached because an earlier one fails. Each row assesses the candidate named, the fixed point of Definition 3 where one exists; a different proposed partition of the same matter is a different candidate and is tested on its own. Each row decides individuation only, never standing or what is owed.

Case	C	E	M	Result	Deciding reason
Rock	no	·	·	Not a subject	Persists by inertia: $T_{off} \geq T_{on}$, so its boundary is static (Definition 4).
Flame	yes	yes	no	Not a subject	No slow structure. Its state is fixed by the fuel and air flowing through it.
Hurricane	yes	yes	no	Not a subject	Its structure is its current flow field. The eyewall replacement cycle reconfigures that same field and carries nothing across it. No carrier settles which response occurs, so (M) fails at Definition 7(ii). Its cold wake, which can shape what it does next, lies outside its boundary and is not its memory.
River	no	·	·	Not a subject	Stop the flow and its channel and water stay where they are, so it is static. Te Awa Tupua is a different candidate (above).
Virus	no	·	·	Not a subject	Capsid static outside a host, built by the host's machinery inside.
Physarum polycephalum	yes	yes	yes	Subject	Metabolically maintained membrane. Memory encoded in its tube diameters (Kramar and Alim 2021).
Cell	yes	yes	yes	Subject	Maintains its membrane. Cell identity, held by self-sustaining gene regulation, is carried into culture.
Early embryo, before the blastocyst	no	·	·	Cells are subjects	The composite fails: its edge is the zona pellucida, which persists when its activity ceases.
Blastocyst	yes	yes	yes	Subject	The trophectoderm holds its edge by its own pumping. Keeps its own developmental course on transfer.
Liver	yes	yes	no	Cells are subjects	A composite of cells, so (M) must be relational (Definition 8). The relations that set its size and function are held by the organism: a graft grows to the size the recipient requires (Kam et al. 1987). Its cells remain subjects; the organ-level candidate fails.
Organism	yes	yes	yes	Subject	Relational memory, neural and immunological, carried wherever it goes.
Harvester ant colony	yes	yes	yes	Subject	Relational memory: each year a colony returns to about half of its previous foraging range, more than chance would give and whatever its age, while each worker lives at most a year (Gordon 1995). Colonies live 25 to 30 years (Gordon 2024).
Living city	no	·	·	Not a subject	The city as a whole has no boundary whose membership its own activity maintains. Its sharp edges are chartered or territorial.
Chartered city, corporation, state	no	·	·	Not a subject	The chartered entity is the candidate. Its boundary persists by charter or territory when members stop acting, so it is static. A community its members hold is tested separately.

Case	C	E	M	Result	Deciding reason
Digital twin	no	·	·	Not a subject	Its state and boundary persist through infrastructure its operators run.
AI system	no	·	·	Not a subject	See Section 8.
Sleeping person	yes	yes	yes	Subject	Subjecthood does not track wakefulness. See Section 9.
Corpse	no	·	·	Not a subject	The organism's activity has ceased. Residual microbial and cellular processes do not restore its fixed point.
The universe	·	·	·	Not individuated	No partition: fails Definition 2. See Section 10.

Four further instances test parts of the record the first table leaves untouched: suspension, memory carried outside a brain, a genotype offered as a boundary, and a colony whose edge does not need its members.

Case	C	E	M	Result	Deciding reason
Tardigrade, in a tun	no	·	·	Suspended	Dried into a tun, it holds its boundary and memory statically (Møbjerg et al. 2011). On rehydration it resumes as the same line (Remark to Corollary 6.1).
Planarian, after its head regrows	yes	yes	yes	Subject	Trained, decapitated and left to regrow a head, worms relearned in a single session (Shomrat and Levin 2013). The memory was carried outside the head (Section 9).
Genet: honey fungus, aspen clone	·	·	·	Not a candidate	One genotype is not a boundary (Definition 3). An *Armillaria* genet spans about 965 hectares (Ferguson et al. 2003) and the Pando clone about 43 (DeWoody et al. 2008). Each body its own activity holds is tested on its own.
Bacterial biofilm	no	·	·	Cells are subjects	Its edge is a matrix of extracellular polymers (Flemming and Wingender 2010), which stays when its cells stop, so the composite is static, as the early embryo's zona is.

Some candidates await the evidence the test needs, and here the record supplies the test without a verdict, as it does for human collectives. A *Dictyostelium* slug forms when amoebae, each a subject, aggregate and migrate as one (Kessin 2001): a new candidate forming within subjects already living, as at the blastocyst (Corollary 6.3), which passes if the slug holds its own edge and memory relational under Definition 8. A siphonophore, a colony of specialised zooids (Dunn and Wagner 2006), is decided by which candidate holds the edge and the memory, whatever it is called. Xenobots, assembled from living frog cells (Kriegman et al. 2020), continue the line (Corollary 6.3) and are tested on their own. Each is a place the record can be tested on grounds fixed in advance (Section 11).

8. AI Systems

An AI system as built is not an individuated subject: it fails (C) on every boundary it is built with, and its memory fails (M) at Definition 7(i). Under FR12 this does not place it outside consciousness. It places it within the activity of those who build, run and maintain it, from which it is not individuated.

An AI system fails (C) by Definition 5 on every boundary it is built with. Its physical boundary is static: halt the computation and the hardware persists, so $T_{off} \geq T_{on}$. Its process boundary persists as allocated when the computation is paused. It ends only when an operating system or an operator ends it, and Definition 4 holds both fixed, so again $T_{off} \geq T_{on}$. Any other candidate, such as cluster membership

held by a lease or a heartbeat, fails in the same way: it ends only when another system ends it, and Definition 4 holds that system fixed.

An AI system's slow structure, the trained weights, persists in storage whether or not the system runs, so it is not maintained by the system's activity and (M) fails at Definition 7(i). The same holds for every AI system whose state persists independently of the computation that uses it, as digital state is engineered to do, including systems that adapt online, keep persistent state or manage their own resources: stored weights and memory do not decay when the system stops, and where volatile memory needs refreshing, the refresh is done by the hardware, not by the system's activity. State set to expire, by a timeout or a time-to-live, is ended by the store that enforces the expiry, which Definition 4 likewise holds fixed. An entry that expires on a timer run by the system itself is ended by the system's own activity, so when that activity ceases the entry stays. A timer counts as x's activity only when x's own processes perform the expiry; a clock or store that performs it is another system.

The same holds for systems spread across many nodes, including swarms and meshes: when their computation stops, what they hold stays where it is. A candidate whose memory is the pattern of communication among the nodes is a distinct candidate and is tested on its own. Where that pattern is held in node state that stays when computation stops, as in systems as built, it fails in the same way.

For AI systems as built, the hardware is not a constituent under Definition 3: the operations that maintain storage are performed by the hardware and its controllers, not by the system's computation. A candidate that included them would be a different candidate and is tested on its own. Its boundary would then be the hardware's, which persists when the computation stops, so it fails (C) whatever its memory does. To pass, a system must produce and hold its own boundary. Every candidate an AI system as built offers fails at least one of (C) and (M). Either failure is sufficient for the exclusion.

The exclusion is architectural. It is not a matter of substrate or of capability. A system that produced and held its own boundary against an environment it did not control, with memory maintained by its own activity, would satisfy the criterion and be life under this record, whatever its material. No existing AI system is built that way.

The governance tier does not depend on this section. FR02 proves that no total computable function can resolve authorisation without an exogenous declaration, and FR06 requires that δ be declared by a named human source. This record gives the ontological reason the system is not the one who declares. The gate never needed that reason.

Subjecthood is not standing. Under FR06 and FR08 Section 1.2, δ is declared by a named natural person. A bacterium, an ant colony and a future synthetic organism would each be an individuated subject under this record, and none acquires standing to declare δ by being one. This record adds an independent reason for the exclusion FR02 and FR06 already impose. It changes nothing at the gate. The same holds for collectives: a self-maintaining community that passes the criterion gains no standing by passing it, and competing claims between nested subjects remain questions for the governance tier.

Before birth. The same holds before birth. The zygote is a cell and passes. The early embryo is a composite of cell subjects and is tested as one: while its edge is the zona pellucida, an acellular shell that persists when the embryo's activity ceases, the composite boundary is static and fails (C), and its cells are the subjects. At the blastocyst, the embryo's own activity holds its edge: the trophectoderm seals its junctions and pumps fluid inward (Watson and Barcroft 2001). The composite then passes, including the transplant test the liver fails: transferred to a uterus, it keeps its own developmental course rather than taking its form from its host. Where an embryo divides into twins, one candidate becomes two, as at division. An embryo in cryopreservation is suspended, which interrupts no standing and licenses no act toward it (Remark to Corollary 6.1; Section 0); on resumption it continues as the same line, with what it carried. Here as throughout, this record states what is individuated, not what is owed (Section 0). Standing is a separate line, placed by the governance tier and not derived here. The governance tier recognises natural persons (FR08 Section 1.3) and does not supersede the law (FR08 Section 1.4), so its line is the law's and moves with it. In the common law natural personhood begins at birth, and wherever the law places it there, the natural person the governance tier protects until birth, including under FR13 stewardship, is the mother; where the law

recognises the unborn, they enter the governance tier as natural persons, and no result in FR01 to FR13 changes.

The traditions draw their own lines, and this record decides none of them. The Catholic Church holds that the human being is to be respected and treated as a person from the moment of conception (*Donum Vitae* I.1; *Dignitas Personae* 4 to 5). Hindu tradition, in the *Caraka Saṃhitā*, holds that the embryo forms when the *jīva*, with mind, descends into the union of the parents' seed (Śārīrasthāna 3.3). Buddhist teaching counts a human life from the time consciousness first arises in the mother's womb (Vinaya, Pārājika 3; Majjhima Nikāya 38). A widely held view in Islamic tradition places the breathing of the soul after three stages of forty days (Ṣaḥīḥ al-Bukhārī 3208; Ṣaḥīḥ Muslim 2643). Jewish law counts the fetus as part of its mother's body until labour (b. Gittin 23b; b. Arakhin 7a), and as a *nefesh*, a life in its own right, once it has emerged (Mishnah Oholot 7:6). Being counted part of another body and being a subject are compatible: a cell is a constituent of its organism and a subject in its own right (Corollary 6.2). Each tradition's line concerns the soul, the person or what a life is owed, and this record speaks to none of these (Section 0). It finds only that, within the line, subjecthood is never absent while the line's own activity runs: before conception, at it, or after it (Corollary 6.3).

9. Subjecthood Does Not Depend on Capacity

Subjecthood under this record does not depend on cognitive capacity, communication, awareness, or the ability to contest. Condition (M) is satisfied by any slow structure the organism itself produces and carries, including immunological memory, which the organism holds in the composition of its lymphocyte repertoire rather than in any one cell, and other bodily memory. In every human life, while its own activity runs, subjecthood is never absent: in the zygote as a cell, in the early embryo as its cells, and from the blastocyst on as the embryo itself (Section 8; Corollary 6.3).[1]

Subjecthood and contestation are separate objects. Definition 7(ii) is a criterion of individuation: it says what makes a standpoint x's own. It is not a criterion of resistance. Whether an action is an element of R_S is decided only by FR10 Definition 2.1 and FR11 Section 2.1: it must originate with the subject and be directed at a decision outcome. An immune response is selection in the sense of Definition 7(ii) and is not R_S, because it is not directed at a decision outcome. A person's appeal is both. The two criteria answer different questions, and one act can meet both: (ii) concerns how what x has kept settles a response, and resistance concerns what a response is directed at. This record adds nothing to R_S and removes nothing from it, as Section 8 adds nothing to standing.

R_S does not require speech. FR11 Section 2.1 counts a subject-originating action directed at a decision outcome as legitimate resistance, coherent or not. Where a subject cannot contest, FR13 Section 9 governs: silence is not consent, and the system enters stewardship.

FR13 holds the seat for the natural person who cannot speak. This record establishes that the person in the seat is fully a subject, whether or not they can speak.

10. Relation to the Corpus

FR12

FR12 proves that the governance primitives are the unique resolution structure for any decision-permitting system interacting with conscious agents, and Section 7 argues that the convergence reflects the structure of conscious reality. Under that ontology, this record answers a question FR12 leaves open: which systems are individuated subjects. It neither widens nor narrows FR12's scope: for governance, human actors and human subjects remain natural persons (FR08 Sections 1.2 and 1.3). The exclusions that force the primitives in FR12, of boundaries taken as given

[1]Nothing in the governance tier turns on this: this record is not a clinical or legal determination of death, and its verdict can differ from brain-death criteria.

and of self-grounded scope, reappear here as the exclusions that leave one ground for a subject's boundary.

FR13

FR13 specifies who occupies the positions the architecture requires. This record specifies what can occupy a position at all. The two answers meet in Section 4. A subject and a valid declaration have the same structure: each is produced by its own source and tested from without.

The universe

The universe has no x and not-x to partition, so it fails Definition 2 and is not a candidate. It is not an individuated subject, and under FR12's ontology that is correct: it is not a subject within consciousness but that of which individuated subjects are partitions.

Remark. The universe case is the no-given-boundary premise seen from the other side: because the ground has no boundaries, none can be given, and every real boundary has to be produced and held.

Points of contact

Yogācāra's storehouse consciousness (*ālaya-vijñāna*) holds seeds (*bīja*) laid down by past action that shape how experience arises, which is close to condition (M), reached by contemplative means (Vasubandhu, *Triṃśikā*). Kastrup's analytic idealism treats living organisms as the appearance of dissociated processes within a universal consciousness (Kastrup 2018). This record derives the criterion such a view requires, which Kastrup identifies with life but does not derive. Jonas located the beginning of selfhood in metabolism, an organism remaking itself against its surroundings (Jonas 1966). Cosmopsychism takes one consciousness as fundamental and must say how it divides into subjects (Shani 2015). Theorem 5.3 is this record's answer to where those divisions fall. Three further traditions reach parts of the same ground. Advaita Vedānta holds one consciousness, divided into selves as space is divided by jars, the division made by the jar and not by the space (Gauḍapāda, *Māṇḍūkya Kārikā* 3.3 to 3.7); it holds the division apparent, where this record holds a partition real when it is produced and held. Aquinas held that the soul is the form of the living body and that the living are those that move themselves (*Summa Theologiae* I, q. 76, a. 1; q. 18, a. 1); the second is close to Corollary 6.1. Ibn Sīnā held that each human soul comes to be with its body and is individuated through it (*Kitāb al-Nafs* V.3), which is close to individuation by a held boundary. All are points of contact, not premises.

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11. Falsification

The result is conditional on FR12 Section 7's ontology and on the three premises stated below. Under emergence, sufficiency would require showing that the three conditions produce experience, which this record does not attempt, and the biconditional is lost. That is the falsification condition, the same one FR12 Section 7 carries. Within the ontology, the record rests on three premises, and a challenge to it properly lies there: the constitutive premise of Definition 1, that a persisting, internally maintained difference in how x meets the same present is a standpoint of x's own; the partition premise; and the no-given-boundary premise (Section 1). Everything else follows from these, from Definition 1's account of a real partition, and from FR12. Empirically, the record is broken by a system that meets (C), (E) and (M) and is shown, on grounds fixed in advance, not to be individuated, or that fails one of them and is shown on such grounds to be individuated. Such grounds are a marker of individuation from biology, or the verdict of a rival criterion, named before the test is run. It is also broken by a ground of subjecthood that fixes a set of processes in none of the three ways of Lemma 5.1.

Core Finding

Consciousness is fundamental and has no boundaries. Life is where boundaries are made and held. Each living boundary makes a point of view: a place within the whole from which to meet the rest. The whole has no such place, because nothing lies outside of it. Life is life.

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