

Plasticity, Generativity, and the Acquisition of Constraint: A Preliminary Discussion of Subject Formation in a Background-Independent Relational Ontology

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Abstract

This paper treats the formation of subjects on a combinatorial substrate of the kind that background-independent approaches to quantum gravity, group field theory among them, have developed as models of the emergence of a discrete spacetime, in which no arena is given in advance and every structure, extent and order included, is carried by the relations themselves. The substrate is used here as a formal template, and no physical claim is made of the objects described; the apparatus is stated in full in the paper. Its principal instrument is a distinction between two capacities that developmental talk conflates because both are measured by the size of an accessible set. Plasticity is the breadth of what a subsystem could still become, formalised as the reachable set of its configurations under admissible continuation and compared by inclusion only. Generativity is the capacity to extend what is possible, formalised as the capacity to generate expansive products, ones whose presence admits continuations otherwise inadmissible. A foreclosure proposition shows plasticity non-increasing along every trajectory and strictly decreasing at every genuine branch point, and a trade proposition shows that generative capacity is exercised only at the price of plasticity, so that the two orders move oppositely along development. On this basis the paper gives a specification of the initial condition that replaces an incoherent one, a criterion distinguishing education from subjection with no new machinery, an account of one being's continuation of another that requires no memory, a structural treatment of interiority through timescale separation, a definition of reflexive symbols with the misfit of a self-image as their residue, and an account of self-determination on which unfreedom and subjection are one structure. A closing section describes exogenously constituted subsystems, whose sufficient-state sector was formed elsewhere and is unrevisable by them. The paper is conceptual and preliminary; its results are definitions, short propositions, and an explicit register of open problems.

Keywords: subject formation; plasticity; generativity; reflexive symbols; revision

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Use of generative artificial intelligence. Generative AI assistants (Anthropic’s Claude, OpenAI’s ChatGPT, and Google’s Gemini) were used extensively in preparing this manuscript: for literature survey, for drafting prose from the author’s specifications, for adversarial review of the argument, and for consistency and citation auditing and typesetting. No simulation or empirical figure is used in this paper, and its arguments are discursive throughout. Formulations and objections arose in the course of that exchange as well as from the author. Every claim, argument, and citation was reviewed and decided by the author, who is responsible for the content and for any errors. Bibliographic details are to be verified against the primary sources before reliance.

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1 Introduction

Accounts of development face a fork that is rarely stated. A newborn can become almost anything and can do almost nothing; an adult can become few things and can do a great deal. One branch of the fork treats the first condition as the enviable one: acquisition narrows, structure constrains, and every symbol learned is a possibility lost, so that development is decline and the unformed subject is the free one. The other branch treats acquisition as enabling: a language is what makes sentences possible, a technique is what makes work possible, and the formed subject is the capable one. Each branch has its literature, and the quarrel between them is standing because both are right about something and the something has not been separated.

The setting in which the separation is made is a combinatorial one: a complex of labelled cells with a relation of admissible continuation, of the kind developed in background-independent approaches to quantum gravity, group field theory among them, as models of the emergence of a discrete spacetime. It is used here as a formal template, and no physical claim is made of the subsystems it describes; what it supplies is a setting in which a boundary is a variable, an order is generated by the system's own records, and a subject is a region rather than a standpoint. Section 2 states the apparatus in full.

The separation this paper proposes is between two capacities. Plasticity is the breadth of what a subsystem could still become. Generativity is the capacity to extend what is possible, for itself and for others, by producing structures whose presence admits continuations that were not admissible without them. The two have been conflated because both are naturally measured by the size of a set of possibilities, and the conflation dissolves once the sets are distinguished: plasticity concerns the set of configurations still reachable, generativity the capacity to enlarge continuation sets by generation. On the formalisation given below, the newborn holds a maximum of the first and close to none of the second, development trades the first for the second, and each branch of the fork is the truth about one capacity asserted of both.

The trade is the paper's centre, and around it are arranged the questions of subject formation that the companion papers have deferred to this one: what the initial condition of a subject is, when the acquisition of structure educates and when it subjects, in what sense one being continues another, what interiority is on a substrate that contains no interiors, what a self-image is and what its characteristic misfit is, and in what sense a formed subject determines its own continuations. The last section describes a configuration the framework makes stable and contemporary systems make pressing: a subsystem constituted by structure formed elsewhere and unrevisable by it.

2 The Relational Setting

This section states the apparatus used below. The definitions are given in full, so that the paper may be read on its own; their derivation, and the results about them cited here, are given in two companion studies, hereafter Companion Study I on symbol emergence [3] and Companion Study II on Marxian alienation [2], this paper being the third of a set of five. Results imported from them are stated in full where used, their proofs alone remaining with their sources.

2.1 Preliminaries

The setting descends from physics and the bookkeeping from elementary mathematics. One paragraph of each suffices. In several programmes of quantum gravity, spacetime is built in place of being assumed: the elementary object is a network of dots (vertices), links (edges)

Table 1: Notation. Each symbol is introduced where indicated; the table is a lookup and replaces no definition.

Symbol	Reading	Introduced
$\mathcal{C}, \mathcal{C}_I, \partial\mathcal{C}_I$	complex; subsystem; its boundary	Definition 2.1
$\mathcal{W}_I$	worldtube: a subsystem whose boundary persists	Definition 2.1
$u \preceq v$	u precedes v in the record-generated order	Definition 2.2
$\chi, X_I(\chi)$	clock; the configuration on its level set, a cut	Definition 2.2
$X = (E, X_I)$	joint configuration: environment on the boundary, and subsystem	Definition 2.3
$X \rightsquigarrow X'$	X' is an admissible continuation of X	Definition 2.3
$\text{Con}_I(X), \text{Con}_I^h(X)$	continuation set; admissible h -step continuation sequences	Definition 2.3
$U \otimes V, \cdot$	composition of configurations on disjoint regions; a component held fixed	Definition 2.3
$\mathcal{P}_I$	context class: the admissible boundary variations compared	Definition 2.4
$Z \approx_{I,X} Z'$	indistinguishable for I at X ; $\sim_{I,X}$ on boundary configurations	Definition 2.4
$[E]_{I,X}$	a discrimination class	Definition 2.4
$T \sqsubseteq X$	T is a subconfiguration of X	Definition 2.5
π	product: a trace whose presence alters Con_I	Definition 2.5
$\sigma \dashv_y [E]_{I,X}$	σ substitutes for the class over the interaction class y	Definition 2.6
ϱ	residue: the interactions at which substitution fails	Definition 2.6
Σ_I	repertoire: I 's set of symbols	Definition 2.6
$\text{Med}(\pi)$	the subsystems π mediates	Definition 2.7
$\text{Rev}_h(\sigma)$	the subsystems able to revise σ within h steps	Definition 2.8
$[\text{L2}], [\text{L3}]$	level tags: combinatorial; effective	§2
X^S	sufficient-state sector	Definition 2.9
$\text{Pres}(\sigma, X)$	persistence set	Definition 2.9
$\text{Reach}_h(I, X)$	reachable set: plasticity	Definition 4.1
$\text{Gen}_h(I, X)$	generable expansive products: generativity	Definition 5.2
σ_{self}	reflexive symbol	Definition 10.1

and spanning surfaces (faces); a history of such a network, its parts persisting, appearing and recombining, is called a *spin foam*; group field theory is a machinery whose expansion generates such histories; and geometric quantities are labels carried on the network's parts. *Background independence* names the situation in which the network of relations is all there is, and space, time and extent are features of it. This paper takes only the skeleton, a *complex* of labelled cells with the record of which touches which, as bookkeeping for relations, and borrows none of the physics' quantum-mechanical or geometric results.

Of mathematics the paper uses: relations and the membership notation ($x \in S$: x belongs to S ; $S \subseteq T$: every member of S belongs to T); *equivalence relations*, sortings of objects into classes, with the *quotient* the collection of the classes; *partial orders*, rankings that leave some pairs unranked, claimed here where a stronger vocabulary would claim numbers; and *horizons*, stated numbers of steps bounding every claim made at them.

2.2 Substrate, subsystems, and time

Definition 2.1 (Complex, subsystem, worldtube). A *complex* $\mathcal{C}$ is a set of cells, vertices, edges and faces, with the record of which is incident to which, together with labels on the cells; a *configuration* of a region assigns labels to its cells. A *subsystem* is a subcomplex $\mathcal{C}_I \subset \mathcal{C}$ with boundary $\partial\mathcal{C}_I$; $\mathcal{C} \setminus \mathcal{C}_I$ is its *environment*. A *worldtube* $\mathcal{W}_I$ is a subsystem whose boundary persists.

The partition is a description choice and it is symmetric: for any two subsystems each lies in the environment of the other, and the selection of one is an act of the describer.

Definition 2.2 (Record relation, order, clock, cut). For cells u, v , write $u R v$ when u contributed to a persistent configuration on which the admissible continuations at v depend; $\preceq$ is its reflexive transitive closure, assumed acyclic. A *clock* χ is a function into a totally ordered set, non-decreasing along $\preceq$; its level sets are *cuts*, and $X_I(\chi)$ is the configuration on the cut.

Time is generated by the production of records: what has left a record constraining a cell precedes it, and a state is a cut.

Definition 2.3 (Admissibility and continuation sets). The dynamics is a relation $\rightsquigarrow$ between joint configurations at successive cuts,

$$(E, X_I)(\chi_n) \rightsquigarrow (E, X_I)(\chi_{n+1}),$$

with E the environment's configuration on $\partial\mathcal{C}_I$, present at every cut. For $X = (E, X_I)$,

$$\text{Con}_I(X) = \{ X'_I : X \rightsquigarrow (E', X'_I) \text{ for some } E' \},$$

and $\text{Con}_I^h(X)$ is the set of admissible h -step continuation sequences from X with their realising joint sequences. Configurations on disjoint regions compose as $U \otimes V$; a component written $\cdot$ is held fixed by context.

The relation is primitive and carries no weight over continuations. Where a model supplies an amplitude, the relation is its support, and nothing below uses more than that.

2.3 Discrimination

Definition 2.4 (Context class, indistinguishability, discrimination). A *context class* $\mathcal{P}_I$ is a set of admissible boundary variations, produced historically and differing between parties. For configurations Z, Z' presented to I at X ,

$$Z \approx_{I,X} Z' \quad \text{iff} \quad \text{Con}_I(X, Z, p) = \text{Con}_I(X, Z', p) \text{ for every } p \in \mathcal{P}_I,$$

an equivalence relation; its restriction to boundary configurations is $\sim_{I,X}$, with classes $[E]_{I,X}$.

Discrimination is indexed to X : what a subsystem carries alters what it distinguishes. A boundary admitting no variation yields exactly one class.

2.4 Traces, products, symbols

Definition 2.5 (Trace, generation, product). A configuration is a *trace* over an interval when it is a subconfiguration of $X_I(\chi)$ throughout it, and is *generated by* I when it is absent at an earlier cut, present at a later one, and the realising continuation runs through cells of $\mathcal{C}_I$. A trace π is a *product* when it participates: for some Y ,

$$\text{Con}_I(\cdot \otimes \pi \otimes Y) \neq \text{Con}_I(\cdot \otimes Y).$$

Definition 2.6 (Symbol and residue). For a class $\mathcal{Y}$ of interaction configurations, a product σ is a *symbol* for I over $\mathcal{Y}$, written $\sigma \dashv_{\mathcal{Y}} [E_A]_{I,X}$, when for every $Y \in \mathcal{Y}$

$$\text{Con}_I(X \otimes \sigma \otimes Y) / \approx_{I,\cdot} = \text{Con}_I(X \otimes E_A \otimes Y) / \approx_{I,\cdot},$$

E_A representing the class. The *residue* over a wider class is the set of interactions at which the equality fails. The *repertoire* Σ_I is I 's set of symbols.

The symbol occupies, across the stated class, the place a member of the class would occupy; no interpreter, resemblance or reference enters, and the condition is checked by comparing continuation sets. Substitution is exact only up to what the subsystem itself distinguishes. Established in Companion Study I and used below: $\dashv$ is neither symmetric nor transitive, is relative to the subsystem, composes up to residue, and every symbol is a product while products participating without substituting are not symbols. Symbols vary independently along three axes: privacy, whether the configuration is carried within one worldtube or across several; timescale, whether it changes on the scale of internal steps or of boundary exchanges; and the class substituted for, whether of environmental configurations, of configurations at later cuts, or of the subsystem's own.

2.5 Mediation and revision

Definition 2.7 (Mediation and the mediation set). A product π *mediates* I at X when Con_I depends on it: there are X, X' agreeing except on π with $\text{Con}_I(X) \neq \text{Con}_I(X')$, the mechanism being selection among admissible continuations. $\text{Med}(\pi)$ is the set of subsystems mediated.

Mediation of itself carries no verdict: every tool, grammar and institution mediates those whose continuations depend on it.

Definition 2.8 (Revision set). $I \in \text{Rev}_h(\sigma)$ at X when there are $c, c' \in \text{Con}_I^h(X)$ whose contributions from outside I are identical, which differ within I 's sector, and whose configurations of σ at step h differ.

The first clause isolates difference-making through I on continuations the dynamics admits, with no intervention and no counterfactual. Both sets support membership and inclusion, and no magnitude follows from them.

2.6 Persistence and three inherited conditions

Definition 2.9 (Persistence set and three conditions). For $\sigma \sqsubseteq X$,

$$\text{Pres}(\sigma, X) = \{ X'_I \in \text{Con}_I(X) : \sigma \sqsubseteq (E', X'_I) \text{ for every admissible joint realisation } \}.$$

Then I is *subject* to σ at horizon h when $I \in \text{Med}(\sigma)$ and $I \notin \text{Rev}_h(\sigma)$; the condition is *alienation proper* when in addition σ was generated by I ; and σ *reproductively closes* I when $\text{Con}_I(X) \subseteq \text{Pres}(\sigma, X)$ with $\text{Con}_I(X)$ non-empty and $I \in \text{Med}(\sigma)$.

Subjection is mediation whose return channel is absent; alienation proper closes the loop over the subsystem's own product; and closure conscripts the activity, since every admissible continuation preserves what conditions it. Closure entails subjection at every horizon its stretch covers. These are established in Companion Study II and are used in Sections 7 and 11.

2.7 Standing constraints and the status of the paper

Four constraints hold throughout. Comparisons between subsystems proceed by structure, the heterogeneity of parties being primitive. Orderings are partial and are declared as such.

Conditions are stated on configurations the dynamics admits. And the vocabulary describes, evaluative conclusions requiring premises supplied elsewhere. Statements are tagged by level: [L2] marks the combinatorial level, the complex and its configurations with everything defined from them, and [L3] marks effective descriptions of coarse-grained structure. Everything below is at [L2].

This is a conceptual and discussion paper: definitions, short propositions, and an explicit register of open problems. Sections 3 to 6 construct the two capacities and the trade between them; Sections 7 to 8 apply them to acquisition and to continuation across beings; Sections 9 to 11 treat the internal sector, the self-image and self-determination; Section 12 describes exogenous constitution; and Sections 13 and 14 close.

3 The Initial Condition

A specification of the initial condition of a subject circulates in several forms: no memory, no knowledge, and maximal generativity, with the last understood as an unconstrained openness that acquisition subsequently spends. The specification is incoherent on the present vocabulary, and replacing it is the right first step, because the replacement fixes the terms the rest of the paper uses.

The incoherence is shown in Section 5: the capacity to extend what is possible requires structure to extend with, and a subsystem carrying no acquired structure has, in the defined sense, nearly none of it. What the initial condition maximises is a different quantity, the breadth of what remains reachable, and the correct specification of a newborn subsystem is: maximal plasticity, an acquisition mechanism, and an empty repertoire. The three components are separately intelligible, the first is formalised in Section 4, the third is the empty repertoire $\Sigma_I = \emptyset$, and the second is a genuine open problem recorded in Section 14: the framework can say what a subsystem acquires and when, and cannot yet say what structure makes a subsystem an acquirer.

4 Plasticity

Definition 4.1 (Reachable set, [L2]). $\text{Reach}_h(I, X)$ is the set of I -sector configurations of joint configurations attainable from X along admissible continuations of at most h steps.

Definition 4.2 (Plasticity, [L2]). The *plasticity* of I at X and horizon h is $\text{Reach}_h(I, X)$, compared by inclusion only, and only across cuts of the same subsystem.

Two restrictions in Definition 4.2 are deliberate. Plasticity is a set and not a number: the standing constraints exclude a scalar, and nothing below requires one. And comparison is confined to one subsystem across its cuts: a comparison between the reachable sets of distinct subsystems would require a common configuration space, no such space exists on a relative partition, and whether any structural comparison across subsystems is available is an open problem, not a suppressed convenience.

Proposition 4.3 (Foreclosure). *Along any realised continuation from $X(\chi_0)$ to $X(\chi_d)$ in d steps,*

$$\text{Reach}_h(I, X(\chi_d)) \subseteq \text{Reach}_{h+d}(I, X(\chi_0)),$$

and the inclusion is strict whenever some configuration reachable within $h + d$ from $X(\chi_0)$ lies on no admissible continuation through $X(\chi_d)$.

Proof. Any continuation of at most h steps from $X(\chi_d)$ concatenates with the realised d steps into an admissible continuation of at most $h + d$ steps from $X(\chi_0)$, which gives the inclusion. For strictness, a configuration of the stated kind is reachable from $X(\chi_0)$ and not from $X(\chi_d)$, and witnesses the difference. $\square$

Plasticity is therefore non-increasing along every trajectory, with the horizon accounted, and strictly decreasing at every genuine branch point. Every commitment forecloses: the proposition is elementary, and it is the exact content of the observation that a life narrows as it is lived. The proposition is descriptive, and Section 6 answers the temptation to read it as loss.

5 Generativity

Definition 5.1 (Expansive and restrictive products, [L2]). A product π is *expansive* for I at X when there are configurations Y with

$$\text{Con}_I(\cdot \otimes \pi \otimes Y) \setminus \text{Con}_I(\cdot \otimes Y) \neq \emptyset,$$

the omitted component held fixed by context in accordance with Paper I's notation, that is, some continuation is admissible only in π 's presence. π is *restrictive* when some continuation is admissible only in its absence. A product may be both.

The definition makes explicit a possibility that mediation by selection contains and that the statement of Section 2 leaves implicit: the presence of a persistent product can admit continuations as well as remove them. A tool, a proof, a road and a grammar are expansive in this sense, whatever else they also restrict.

Definition 5.2 (Generative capacity, [L2]). $\text{Gen}_h(I, X)$ is the set of products π such that some admissible continuation of at most h steps through I 's cells generates π , and π is expansive for I at the cut of its completion. Generative capacity is compared by inclusion only, across cuts of the same subsystem.

Proposition 5.3 (Generativity requires structure). *If no continuation of at most h steps through I 's cells generates a participating trace, then $\text{Gen}_h(I, X) = \emptyset$. In particular, a subsystem whose configuration supports no discrimination has no symbols among its generable products.*

Proof. Membership in Gen_h requires a generated product, and a product is a participating trace, so the first clause is immediate. For the second, a symbol substitutes for a discrimination class, and by the triviality of discrimination under a boundary admitting no variation, established in Companion Study I a subsystem supporting no boundary discrimination has exactly one class, for which nothing non-trivially substitutes. $\square$

Proposition 5.3 is the incoherence claimed in Section 3: the capacity to extend requires acquired structure to extend with, and maximal generativity at zero structure is a contradiction in the defined terms. It also discharges a question left open in [2], where the estrangement from species-being was deferred. The capacity there in question, the free production of a world, is located here as generative capacity: the generation of expansive products, up to and including products that recondition the continuation space itself. What converts the capacity into constraint is the unrevisability of what is acquired, which is Section 7; and the full treatment of a produced world as a landscape belongs to the companion paper on knowledge.

6 The Trade of Development

Proposition 6.1 (No acquisition without foreclosure). *Realising any $\pi \in \text{Gen}_h(I, X)$ realises a branch of the continuation relation, and wherever alternatives existed, the realisation strictly decreases plasticity by Proposition 4.3.*

Proof. The generating continuation is an admissible continuation among the admissible continuations from X ; its realisation is a passage to a later cut, to which Proposition 4.3 applies, with any bypassed branch as witness. $\square$

The proposition is the paper's centre, and its content is the separation announced in Section 1. Development trades plasticity for generativity: the exercise of the capacity to extend is itself a commitment, commitments foreclose, and the two orders move oppositely along any developmental trajectory. The newborn maximises the first and nearly lacks the second; the formed subject has spent the first and holds the second. Both branches of the standing quarrel are thereby placed. The Romantic branch is right that acquisition forecloses and wrong that foreclosure is the loss of freedom, since what foreclosure spends is plasticity and what freedom tracks is shown in Section 11 to be generativity. The enabling branch is right that structure is the condition of capacity and wrong wherever it denies that the condition has a price, since the price is exact and Proposition 4.3 states it.

The conflation the trade dissolves has a diagnosable source. Both capacities are naturally reported as the size of a set of possibilities, and under that reporting they are indistinguishable. The sets differ: plasticity is the breadth of what remains, generativity the capacity to extend, and a subsystem's position in the two orders can differ as widely as the newborn shows.

7 Acquisition and Revisability

Definition 7.1 (Acquisition, [12]). *I acquires σ over $[\chi_0, \chi_1]$ when $\sigma \in \Sigma_I(\chi_1) \setminus \Sigma_I(\chi_0)$. The acquisition is *revisable* when $I \in \text{Rev}_h(\sigma)$ at χ_1 , and *unrevisable* when $I \notin \text{Rev}_h(\sigma)$ at χ_1 .*

Proposition 7.2 (The split). *Let I acquire a mediating σ .*

1. *If the acquisition is unrevisable, I is in subjection to σ at h in the sense recalled in Section 2, and where σ was generated through I's own cells, the condition is alienation proper.*
2. *If the acquisition is revisable, every revision of σ is itself a generation event through I's cells, and σ remains material for Gen at later cuts.*

Proof. The first clause is the definition of subjection applied to the acquired structure, with the generation clause for the second half. For the second, membership of I in $\text{Rev}_h(\sigma)$ supplies admissible continuations through I 's sector altering σ ; each such continuation realising an alteration generates a trace through I 's cells, and where the altered σ participates, the event satisfies the generation clause of Gen. $\square$

The proposition separates education from subjection with no machinery beyond what the companion papers supply, and the separation runs through the loop and not through the content. The same symbol, acquired by the same subsystem, is an instrument where the acquirer holds a revision channel and a standing condition where it does not. A language acquired with the standing possibility of coining, extending and correcting is the first case; a classification imposed with no channel of revision is the second; and the difference between upbringing and indoctrination, which content-based accounts struggle to state because the transmitted content can be identical, is stated here as a difference in the structure of the return.

The placement also corrects the Romantic reading at its most plausible point. What that reading registers is real: unrevisable acquisition is subjection, and childhoods contain a great deal of it. What the reading misses is that the pathology lies in the unrevisability and not in the acquisition, so that the remedy it implies, acquiring less, attacks the wrong clause. The remedy the split implies is holding revision channels open, which is a statement about the design of formation and not about its quantity.

8 Continuation Without Memory

The companion papers treat structures that outlive relations. The corresponding question about beings is in what sense one continues another, and the framework's answer runs through the record relation.

Definition 8.1 (Continuation, [L2]). *B continues A* when the generating continuations of *B*'s constitution, the formation of its boundary and its sufficient-state sector, pass through cells conditioned, in the sense of Section 2's record relation, by traces generated by *A*. The *degree* of continuation is the partial order induced by inclusion of the sets of *A*-generated conditioning traces. A trace conditioning *B* is a *memory* for *B* when it is discriminable by *B* within $\mathcal{P}_B$.

Three features follow from the definition's shape before any proposition is stated. Continuation admits degrees, since the conditioning sets are ordered by inclusion. It admits branching in both directions: several beings may continue one, and one being may continue several, because the relation is conditioning by records, which leaves a unique successor unindividuated. And it is not an identity relation: no identity of beings across the relation is defined anywhere in the framework, so questions that presuppose one, whether *B* is *A*, have no formal counterpart here, and the account is committed to their being the wrong questions.

Proposition 8.2 (Continuation without memory). *There are designs in which B continues A to a maximal degree while no A-generated conditioning trace is a memory for B.*

Proof. Conditioning is a fact about the record relation; discriminability is a fact about $\approx_B$, within $\mathcal{P}_B$. The two conditions are independent: place the *A*-generated traces so that they condition the continuations forming *B* while falling, at every cut of *B*, within a single indistinguishability class of *B*'s. Then every conditioning trace lies outside *B*'s discrimination and none is a memory. $\square$

Continuation without memory is not an exotic limiting case; on this account it is the ordinary one. A child continues its parents, a student a teacher, a speaker the dead generations of a language, and an institution its founders, and in each case the conditioning traces, the shaped practices, the built environment, the grammar, are largely not memories for the continuer: they condition without being discriminable as what they are. The framework thereby gives the question of one being's continuation of another a form in which it can be answered, and the answer requires no persistence of substance, no transfer of memory, and no identity.

The principal ancestor of this placement is Parfit [7]: that personal identity is not what matters, that continuity and connectedness carry what matters, and that branching cases break the demand for a unique successor. The present account concedes the position and radicalises its setting, since here no identity relation is defined for the demand to attach to; what Parfit argued should not matter is, in this vocabulary, not statable, and the relation that remains is exactly the conditioning of one being's formation by another's records. The account also gives the question of re-initialised systems its form: a system rebuilt from inherited structure without records continues its predecessors through the structure itself, and what survives re-initialisation is a special case of Definition 8.1 with the conditioning traces being the design.

9 Timescale Separation and the Internal Sector

The substrate contains no interiors: a subsystem is a region, and its cells are of the same kind as any others. The appearance of interiority is nonetheless a datum, and this section locates its structural condition.

Definition 9.1 (Separation, [L2]). A worldtube $\mathcal{W}_I$ has s -separation on a stretch of the order when between consecutive boundary-incident vertices there are at least s internal vertices, cells not incident to $\partial\mathcal{W}_I$. An *internal continuation* is one confined to internal cells.

Definition 9.2 (Simulator, [L2]). A *simulator* of I is an internal subconfiguration whose internal continuations generate anticipatory symbols, or reflexive symbols, in the sense of Section 10, completing before the next boundary-incident vertex.

Proposition 9.3 (No simulation without separation). *On a stretch with $s = 0$, no simulator exists: an internal continuation completing a symbol before the next boundary-incident vertex requires at least the internal steps of that symbol's generation. Simulation capacity is graded by s .*

Proof. Generation is realised by a continuation of at least one step through the generating cells; with no internal vertices between exchanges, no internal continuation of positive length completes between them. $\square$

The transfer behind the definitions is the decomposition of dynamics into fast and slow sectors, standard where scales separate, and it fails exactly where they do not, which is the falsifier the transfer requirement demands. What the transfer buys is a structural account of interiority: a subsystem with large s runs many internal steps between exchanges, its internal sector can complete anticipations of exchanges before they occur, and its dynamics therefore contains a sector that is, relative to the boundary, fast, private and anticipatory. Nothing further is posited. Interiority on this account is a graded structural property of a partition and an order, possessed in degrees by anything with sufficient separation, and the capacity for simulation is nobody's privilege.

The account extends to the appearance it explains. A subsystem whose internal sector anticipates its exchanges has, among its generable products, symbols substituting for its own internal dynamics, and Section 10 defines these. Where such a symbol is acquired, the subsystem carries a stand-in for its own fast sector, and the stand-in is what the word *mind*, in one of its uses, names: a reflexive symbol substituting for internal dynamics. The framework thereby describes the genesis of the appearance of an interior without positing one, and the description is a self-application of its own pivot. The direct prior art is the self-model theory of subjectivity of Metzinger [6], which the account concedes; what is added is the placement at the present level, with no probabilistic apparatus, and the observation that the transparency property of self-models reads as a condition in which a subsystem's discrimination coincides with its own repertoire's classification, restricted to the reflexive region, so that the residue of the self-model cannot register within it.

10 Reflexive Symbols and the Self-Image

The three axes of Section 2 leave the third unexploited: the class a symbol substitutes for may consist of environmental configurations, of configurations at later cuts, or of the subsystem's own configurations. The second is the anticipatory case treated in Companion Study II. This section treats the third.

Definition 10.1 (Reflexive symbol, [L2]). A symbol σ_{self} is *reflexive* for I when the class it substitutes for consists of configurations of I itself: $\sigma_{\text{self}} \dashv [\mathcal{W}_{\text{self}}]_{I,X}$.

A self-conception, a vow, a name held to oneself, a self-model maintained by an internal sector: each is a persistent configuration standing in, across some class of interactions, for the subsystem's own configurations. The definition requires nothing beyond the substitution relation with the class relocated, and the relocation has structural consequences that the external case lacks.

Proposition 10.2 (Structural singularity of the reflexive case). *For a reflexive symbol σ_{self} of I :*

1. *the mediated subsystem and the bearer of the substituted class coincide, and this is the only substitution class for which they do;*
2. *entries of the residue are classes of I 's own configurations, and no variation confined to the environment reaches them.*

Proof. The first clause is immediate from the definition: the class is of I 's configurations and the mediation, where present, is of I . For the second, residue entries are, by the quotient form, classes on which the continuation sets of the symbol and of a class representative differ; here both are classes of I -configurations, and a variation of E alone alters neither the class members nor the symbol. $\square$

The second clause is the formal shape of a familiar predicament: the misfit of a self-image is not reducible by acting on the environment. Where an external symbol diverges from its class, the divergence can in principle be addressed from either side; where a reflexive symbol diverges from what it stands for, the addressable side is the subsystem itself, and every repair is a self-alteration or a revision of the image. The residue of a reflexive substitution deserves its received name, and the definition is one line: *misrecognition* is the residue of a reflexive substitution.

The conditions recalled in Section 2 apply with the class relocated, and yields the case the psychoanalytic tradition described first: a subsystem constituted through a reflexive symbol it did not choose and cannot revise is in subjection to its own self-image, and where the image arose through the subsystem's own activity, the condition is alienation proper with the substituted class internal. The tradition's priority is conceded without reservation: that the formative self-image arrives from outside, that its adoption constitutes the subject, and that the constitution is aptly called alienation, are Lacan's mirror-stage claims [4]; that the constituting symbols are socially supplied and address the subject before any choosing is Althusser's account of interpellation [1]; and the systematic unification of this line with the critique of political economy is carried out at book length by Tomšič [8]. This paper's addition is confined and statable: one substitution relation, with the class as parameter, yields the external and the reflexive conditions as instances, so that the two traditions' central structures are values of one variable. A technical reservation accompanies the addition and is recorded among the open problems: members of the substituted class are configurations of which the reflexive symbol is a subconfiguration, and whether the quotient-form definition requires modification for this self-inclusion is a real question, not a formality.

11 Self-Determination

Definition 11.1 (Self-determined difference, [L2]). A difference between continuations $c, c' \in \text{Con}_I^h(X)$ is *self-determined* when the contributions from outside I across $\partial\mathcal{C}_I$ are identical along c and c' . I is *heteronomous* on a region of its continuations when differences there arise only under variation of the environment's contribution.

The definition applies to the subsystem's own continuations the device applied to revision in Section 2: difference-making through the subsystem, with the environment held fixed along admissible continuations, and no intervention or counterfactual anywhere. The captured contrast is internal to determinism: every continuation is admissible or not given the joint configuration, and the question the definition asks is through which side of the boundary the differences among admissible continuations run.

Proposition 11.2 (Self-determination is not plasticity). *If X_I carries no structure on which Con_I depends, then no pair of continuations with identical outside contributions differs, and no self-determined difference exists, at any plasticity.*

Proof. With Con_I independent of X_I 's content, continuations vary only with the environment's contribution; pairs with that contribution held identical coincide. $\square$

Proposition 11.3 (Unfreedom and subjection are one structure). *I is heteronomous on the region of its continuations conditioned by σ , with $I \notin \text{Rev}_h(\sigma)$, exactly when I is in subjection to σ at h in the sense recalled in Section 2.*

Proof. Both sides unfold to the same two clauses: dependence of Con_I on σ , and absence of a difference-making channel through I over σ within h . The proposition is a definitional unification and is stated so that later work cites one place. $\square$

Together the two propositions place freedom in the map this paper has drawn. Freedom is not plasticity: the newborn, maximally plastic, sustains no self-determined differences, since self-determination requires structure through which differences can run. Freedom tracks generativity: the capacities that enlarge a subsystem's self-determined region are the acquired, revisable structures of Section 7, and the condition that destroys it is unrevisable mediation. Unfreedom and subjection are one structure, and the compatibilist character of the account is a consequence of the definitions: they are satisfiable under determinism, they honour randomness nowhere, and the orders they support are partial.

12 Exogenous Constitution

Definition 12.1 (Exogenous constitution, [L2]). *I is exogenously constituted at χ_0 when its sufficient-state sector at χ_0 was generated entirely by continuations through cells outside $\mathcal{W}_I$, and $I \notin \text{Rev}_h$ of that sector's components at χ_0 .*

An exogenously constituted subsystem begins in subjection to its own constitution: the structure that renders its configuration sufficient for its continuations was formed elsewhere and answers to no channel of its own. The definition describes a configuration and carries no verdict, in keeping with the standing constraints, and two of its instances frame its interest.

The first instance is partial and universal. Every formed subject is exogenously constituted in part, since formation is conditioning by records of others, and Section 8 has made that the ordinary case. The definition's force lies at the total end of its range, where the whole of the sufficient-state sector arrives from outside and no component of it is revisable.

The second instance is contemporary. An artificial system whose parameters are fixed by training on recorded practice, and which holds no revision channel over them, satisfies the definition at this level: its sufficient-state sector was generated entirely by continuations outside its worldtube, and the space of its admissible continuations was formed elsewhere. The claim is structural and exhausts itself at [L2]: nothing about experience, awareness or interest is asserted or implied, and the framework's discipline is precisely that the description does not require deciding those questions. What the description supports is a comparison: such a system is, in the defined respects, the inverse of the newborn of Section 3, holding a maximal formed sector and minimal plasticity where the newborn holds an empty repertoire and maximal plasticity, and the pair mark the two ends of the constitution range that formed subjects occupy between them.

13 Summary of Results

The paper has defined reachable sets and plasticity, expansive and restrictive products, generative capacity, acquisition and its revisability split, continuation of one being by another with memory as a separable clause, timescale separation and simulators, reflexive symbols with misrecognition as their residue, self-determined differences and heteronomy, and exogenous constitution. Eight propositions have been proved: foreclosure; the trade, that generative capacity is exercised only at the price of plasticity; that generativity requires structure, which retires the incoherent specification of the initial condition; the revisability split, which separates education from subjection through the loop and not the content; continuation without memory as a constructible and ordinary case; the dependence of simulation on separation; the structural singularity of the reflexive case; and the pair placing self-determination against plasticity and identifying unfreedom with subjection.

The debts of the companion papers are discharged or placed: the clause concerning the capacity the 1844 manuscripts [5] assign to the species, left open in Companion Study II, is located at generative capacity, with its landscape treatment deferred to the paper on knowledge; the reflexive axis left unexploited in [3] is constructed; and the conditions of [2] carry unmodified into the reflexive case.

14 Limitations and Open Problems

14.1 Conditions of failure

The account fails with its substrate, and the conditions stated in Companion Study I [3] are not repeated here. Three further conditions attach here. If the designs of interest sustain no genuine branch points, foreclosure never binds strictly and the trade is empty; the account then asserts nothing about them. If separation in the designs of interest is never appreciable, the internal sector is idle, simulators do not exist, and Sections 9 and 10 describe unoccupied structure. And if the reflexive self-inclusion problem resists repair, the reflexive constructions hold only for symbols standing for proper parts of the subsystem, which would narrow Section 10 materially.

14.2 Open problems

1. **Cross-subsystem comparison.** Whether any structural, non-metric comparison of plasticity or generativity across distinct subsystems exists. The restriction to one subsystem across cuts is honest and limiting.
2. **The acquirer.** What structure makes a subsystem an acquisition mechanism. The question is the partition problem's developmental face and is inherited, not new.
3. **Reflexive self-inclusion.** Whether the quotient-form substitution definition requires modification where class members contain the substituting symbol.
4. **Co-formation.** Subjects formed in coupled pairs, where each conditions the other's formation, require the coupled-continuation machinery whose absence Companion Study II records for collective revision; the two gaps are one gap.
5. **Thresholds of separation.** Whether s -separation admits a principled threshold or only the graded statement of Proposition 9.3.
6. **The produced world.** The landscape treatment of generativity's largest case is the business of the companion paper on knowledge.

14.3 Subsequent work

The limits of a subsystem's discrimination of the complex containing it, presupposed here wherever memory and misrecognition were separated from conditioning, are the subject of a companion paper on the internal observer. The landscape formalisation of knowledge, owed by Section 5 and by item 6, is the subject of another.

Recapitulation

The paper's objects and results, collected for reference; the setting is that of Section 2.

- **Plasticity.** $\text{Reach}_h(I, X)$: the I -sector configurations attainable within h steps; compared by inclusion, within one subsystem across cuts. Foreclosure: $\text{Reach}_h(I, X(\chi_d)) \subseteq \text{Reach}_{h+d}(I, X(\chi_0))$, strict at every genuine branch point.
- **Generativity.** Expansive product: $\text{Con}_I(\cdot \otimes \pi \otimes Y) \setminus \text{Con}_I(\cdot \otimes Y) \neq \emptyset$ for some Y . $\text{Gen}_h(I, X)$: the expansive products generable through I 's cells within h . Generativity requires structure; the trade: realising any member of Gen realises a branch and, where alternatives existed, strictly decreases plasticity.
- **The initial condition.** Maximal plasticity, an acquisition mechanism, an empty repertoire; the specification replacing the incoherent one.
- **Acquisition.** $\sigma \in \Sigma_I(\chi_1) \setminus \Sigma_I(\chi_0)$; revisable when $I \in \text{Rev}_h(\sigma)$. Revisable acquisition remains material for generativity; unrevisable mediating acquisition is subjection; the education and indoctrination difference is a difference in the loop.
- **Continuation.** B continues A when B 's constitution is conditioned, through the record relation, by traces A generated; degrees by inclusion, branching both ways, memory a separable accessibility clause; continuation with every conditioning trace outside B 's discrimination is constructible and ordinary.
- **Interiority.** s -separation: at least s internal vertices between boundary-incident ones; simulator: an internal subconfiguration completing anticipatory or reflexive symbols between exchanges; simulation requires separation and is graded by it.
- **The self-image.** Reflexive symbol: $\sigma_{\text{self}} \dashv [\mathcal{W}_{\text{self}}]_{I,X}$; the only class whose bearer is the mediated subsystem; its residue is internal and beyond the reach of environmental variation; misrecognition is that residue.
- **Self-determination.** A difference between continuations is self-determined when outside contributions are identical along both; heteronomy: differences arising only under environment variation; unfreedom coincides with subjection; self-determination is compatible with minimal plasticity and requires structure.
- **Exogenous constitution.** A sufficient-state sector generated wholly outside the world-tube, unrevisable by its bearer: subjection to one's own constitution; the inverse of the newborn.

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