

Historical Language Individuation

A Preliminary Generative Relational Study of Boundary Criteria

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Abstract

An inquiry into language preservation presupposes an account of the linguistic formation being followed. This paper investigates the warrant for treating changing, distributed practices as one historical formation, overlapping formations, or branching successors. It develops a preliminary Generative Relational account through critical engagement with individual competence, convention, historical practice, standardization, and reclamation research. The argument distinguishes classificatory agreement, continuing organization, historical lineage, and institutional recognition. Constituent-role comparisons and joint participant reconstruction show how evidence can constrain a boundary without requiring a unique whole-language partition. Inherited history-bearing, field, and operator constructions then connect a candidate formation criterion to the operational profile it selects. A finite continuation refinement retains the distinctions required for the applicability and outcomes of a declared operation repertoire. Its worked interface chain identifies a sufficient coupled profile and an alternative description with explicit external inputs, clarifying the different responsibilities of autonomous prediction and conditional response. Published studies of Nicaraguan Sign Language and Miami reclamation constrain the historical interpretation. An extended stipulated teaching case rejects expression-profile sufficiency and an accreditation proxy for a specified participation question while preserving an adequate individual-and-interaction account as a live alternative. The contribution is a developed linguistic application of inherited resources, with definite model-relative results and revisable historical judgments. The analysis establishes neither a universal language count nor the authority to impose its classifications.

Keywords: language individuation; linguistic formation; historical continuity; Generative Relational framework; regional fields; operation algebras

Scope Note

This paper concerns the individuation of historical linguistic formations. Its central object is the changing organization of linguistic practices, histories, capacities, and relations that a particular inquiry proposes to follow. The paper asks how a proposed unit can be justified and criticized. It does not provide a general theory of language preservation or settle the allocation of resources among communities.

The Generative Relational framework supplies a revisable metalanguage for connecting philosophical interpretation, historical reconstruction, and formal representation. Several of the general distinctions used here are inherited from the author's earlier manuscripts. The present investigation gives those distinctions a sustained linguistic interpretation and subjects them to comparative objections. The mathematical models are several possible representations. Their proofs establish consequences of specified assumptions; they do not turn linguistic identity or legitimate authority into mathematical facts.

Readers primarily interested in the philosophical argument can first read the introduction, literature discussion, linguistic criteria, and GR foundations, then the cases and comparative procedure. The intervening formal sections develop comparison structures and construct operational descriptions for declared boundary profiles. Each construction states its interpretive purpose before introducing its objects. Published empirical studies and stipulated examples have different evidential roles throughout.

References to author-supplied working manuscripts identify the particular versions consulted. They do not imply journal publication or independent validation. A companion source packet records source-specific reading scopes, external citation verification, and reproducible checks of the finite formal examples.

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Notices

Status. This discussion draft presents an evolving inquiry. The definitions, translations, formal constructions, empirical interpretations, and conclusions remain open to criticism and author review. It proposes no official classification of languages or communities.

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Statement On The Use Of Language Models. The author selected the research direction, supplied prior manuscripts and a reference exposition, and requested consistency with the Generative Relational research programme. AI-assisted research, source comparison, drafting, formal checking, and document preparation contributed substantially to this draft. These contributions include proposed arguments and interpretations that remain subject to the author's review. Preparation of a checked draft does not establish the author's approval of every claim. Authorship credit remains with the human author; the use of these tools is disclosed to support critical assessment of the manuscript and its limitations.

1 Historical Linguistic Units

An inquiry into language preservation needs some answer to the question of what is being preserved. The answer becomes difficult before any dispute about successful preservation begins. A collection of recordings can remain intact while the practices that made them intelligible change. A named language can continue to appear in institutional records while its speakers' interaction patterns, repertoires, and standards of correction are substantially reorganized. Conversely, an inherited name can be abandoned while practices and transmission relations continue. These possibilities do not establish that names, records, or grammars are poor objects of inquiry. They establish that an argument about one of them needs further premises before it becomes an argument about the continuity of a language.

This paper investigates those premises through the problem of historical language individuation. Its object is a *linguistic formation*: a provisionally delimited, historically organized configuration of linguistic practices and their relevant relations. The term leaves open which practices belong together, what makes their organization linguistically significant, and how much change their historical continuation permits. It therefore names a candidate object of inquiry rather than a completed criterion. The task is to explain what warrants following such a formation as one unit, several overlapping units, or a family of branching successors.

1.1 The Individuation Problem

Consider a stipulated sequence. Two groups initially learn through a shared network of teachers and interlocutors. Their subsequent interaction becomes less frequent. Each develops locally accepted usages, but people in both groups still consult a common body of texts. Later, one group establishes a separate institutional name. A grammar comparison, an account of teaching lineages, a study of current repair practices, and an administrative register can divide this history differently. The disagreement concerns more than the choice of a word. It affects which changes are described as internal variation, which as contact across a boundary, and which as the emergence of a successor formation.

One response would select a privileged feature and define a language through it. A second would accept every grouping as equally legitimate. The first response owes an argument for making that feature decisive across the selected history. The second fails to distinguish an illuminating reconstruction from a grouping that erases the very dependencies it claims to explain. A more adequate inquiry needs both an explicit comparison target and grounds for criticizing its proposed boundaries. The present paper develops that intermediate task.

Four claims are especially important. Practices can receive the same *classification* because they match a retained profile. They can participate in a continuing *organization* of interaction, learning, interpretation, and correction. They can possess a documented *lineage* connecting earlier and later activity. They can receive common *recognition* from participants or institutions. These claims may reinforce one another. They can also come apart, and their evidential requirements differ. A common grammatical feature does not establish a shared history; a shared ancestor does not establish one present organization; an official label does not establish either.

The paper's central proposal is that an individuation judgment becomes assessable when it identifies the records being compared, the distinctions retained, the historical relation asserted, and the explanatory work expected of the resulting unit. This proposal does not make linguistic reality a product of an investigator's preference. It makes the investigator responsible for showing how a representation answers to that reality. An empirically unsupported lineage remains unsupported even if it produces a convenient classification. A boundary that omits a causally relevant interface needs either a revised boundary or an account of the external input. Purpose dependence creates these obligations rather than cancelling them.

1.2 Historical Organization

The Generative Relational (GR) research programme supplies the paper's organizing perspective. In the relevant sense, a linguistic formation has a history-bearing organization: earlier participation, material

traces, interpretive habits, and relations of uptake can affect what later participants can do. Its current appearance need not display those dependencies. A short recording can sound the same in two cases even though one belongs to a continuing practice of learning and correction and the other to an isolated performance. The difference concerns the historical and practical organization in which the event participates. It is not a claim that one recording contains an additional hidden linguistic substance.

This perspective inherits a considerable conceptual and formal baseline. Earlier GR work distinguishes manifestation from relational organization, develops identity criteria on indexed appearances, separates directed lineage from equivalence, and allows several evidence-constrained boundary reconstructions [6, 10]. The preservation taxonomy further differentiates the object, capacity, conditions, and history relevant to a preservation judgment [12]. These general distinctions are not offered here as discoveries. The present task is to determine what they illuminate about linguistic formations and where a linguistic interpretation requires additional premises.

An important constraint follows. A formation's ability to support further linguistic activity does not by itself make all of that activity one language. Multilingual practices can be productive, and separately individuated formations can depend on common institutions. Generative organization provides an explanatory object, but a claim about its linguistic unity still requires a criterion. Similarly, historical connection can support a succession claim without requiring every successor to count as the very same unit. The argument therefore preserves differences between unity, dependence, common descent, and continued efficacy throughout.

1.3 Research Method

The inquiry combines conceptual comparison, primary-source interpretation, conditional formal analysis, and bounded engagement with published empirical research. The literature discussion reconstructs several different objects that accounts of language legitimately investigate. It asks what individual competence, convention, historical practice, and political recognition explain, then identifies the additional work required for the present historical question. The GR translation is assessed against those differences. A shared formal vocabulary does not establish that the accounts have become one theory.

The formal sections proceed from the same discipline. A represented history can be supported on a labelled two-complex, with temporal precedence and linguistic interpretation supplied separately. Historical witnesses track declared modes of continuation. Regional fields represent distributed local data and their interfaces. Partial operations retain the conditions under which a linguistic action or institutional change is available. These are distinct representational choices whose usefulness must be demonstrated locally. A spin-foam instantiation would require additional structure and is not presumed by the use of a two-complex.

The formal analysis investigates a selected boundary profile. An autonomous description must retain the conditions needed to determine the applicability and retained outcomes of its declared operations. The paper first connects that profile to the candidate formation criterion, then develops an inherited continuation-refinement construction for a finite model. The construction yields a coarsest profile that carries the selected operation repertoire while retaining the initial observation. A worked chain shows why several successful short probes can miss a later dependency and why coupled response-and-interface quantities can suffice without retaining every underlying coordinate. The finite proof concerns a completely specified model; learning its transitions from actual linguistic encounters remains a separate evidential task.

A second construction keeps the target response inside the selected boundary and supplies the relevant interface as an input. It reproduces the same local outcomes conditionally while leaving the future input sequence to a further account. The choice between an autonomous refinement and an open description therefore changes the explanatory responsibility, rather than automatically changing the language count. This positive comparison gives content to the proposal that a formation can retain a warranted boundary while acknowledging constitutive relations and dependencies crossing it.

The empirical discussions serve a complementary role. Research on the development of Nicaraguan Sign Language constrains claims about cohort variation and historical organization. Scholarship on Mi-

ami reclamation constrains inferences from interrupted first-language transmission to the absence of relevant linguistic continuity. Neither case is used as a decisive test of GR as a whole. Stipulated branching and interface cases then isolate inferences that cannot be cleanly separated in a brief empirical summary.

The developed comparison reaches definite judgments at its chosen scale. In the stipulated teaching case, documented mediation defeats an expression-profile explanation that omits the relevant route of interpretation. Competent unaccredited participants and accredited participants without current access defeat a credential-based proxy for the original question. A historically organized account retains those differences, while a sufficiently detailed individual-and-interaction description can remain equally adequate. The contribution is this sustained coordination of linguistic interpretation, historical warrant, formal responsibility and comparative judgment. Generic relational individuation and continuation refinement remain inherited; a universal language count and justified public recognition require further work.

1.4 Argument Sequence

The argument begins by locating the individuation problem among competing accounts of language, then develops criteria for treating a proposed formation as a historical unit. The GR foundations explain why history, manifestation, and generative organization must remain distinguishable. The formal investigations separately address historical comparison, regional dynamics, and operation algebras. The cases then ask what these distinctions change in the interpretation of actual evidence and constructed counterexamples. Explanatory warrant and philosophical objections prepare a comparative procedure for assessing rival boundaries. The concluding discussion identifies the empirical and normative questions that this first inquiry leaves open.

2 Language Individuation Debates

An account of language can succeed at its chosen explanatory task while leaving historical individuation unsettled. The relevant disagreement therefore concerns both the objects investigated and the claims made about them. A computational system, an interpreted abstract language, a shared practice, and an institutionally recognized language are connected objects, but their identity conditions need not coincide. This section examines those connections through selected primary arguments. Its purpose is to identify the additional commitments required when a theory moves from explaining a linguistic capacity or regularity to identifying a distributed formation across time. The resulting comparison supplies constraints on the proposed GR interpretation rather than a ranking of entire research traditions.

2.1 Computational Objects

Chomsky's biolinguistic account deliberately selects a component of human biology from the wider range of language-related phenomena. In his 2004 lecture, an I-language is internal, individual, and intensional: the object includes generative principles, rather than merely the set of expressions they determine. The account also assigns a role to experience in individual development. Its internalism consequently cannot be represented as a claim that acquisition occurs without environmental conditions [1].

For the present inquiry, this position establishes a demanding comparison. A description of distributed social relations cannot replace an explanation of the capacities by which particular people produce and interpret structured expressions. If two speakers differ in their linguistic computations, identifying them as participants in one historical language does not remove that difference. The collective description must answer another question or demonstrate an explanatory relation to it. Calling the description relational supplies neither demonstration by itself.

The converse limitation is equally significant. Suppose an inquiry establishes a precise difference between two individuals' generative systems. A further premise is required to infer that they belong to different historical linguistic formations. Such a premise would identify historical membership with

identity of individual systems. That may be an appropriate stipulation for one comparative task, but it would need independent justification when the inquiry concerns an institution's continuing practices, a dispersed repertoire of expertise, or a lineage of transmission. The shift in analytical object cannot be accomplished by retaining the word *language* while changing its criterion silently.

There remains a substantive objection: perhaps the distributed formation adds no explanatory object at all. Its entire apparent activity could be explained through individual capacities, environmental inputs, and their interactions. A defensible relational response should accept the demand for explanatory work. It should identify an organization whose pattern helps explain a linguistic outcome, and distinguish that organization from a list of its participants. For example, the availability of a correction can depend on who can consult whom, which records are accessible, and whose response is taken up. This is a proposed organizational explanandum, not evidence for a separate collective mind. Whether a particular historical boundary captures it better than an alternative must still be investigated.

2.2 Conventional Use

Lewis explicitly connects abstract semantic systems to social activity through a population's conventions of truthfulness and trust. His account includes indirect coordination with earlier users and accommodates hearers who remain silent. The chapter also addresses heterogeneous populations, overlapping fragments, and open texture through clusters of precise languages. It even leaves competing interpretations of a population's language partly unresolved in a multilingual example [17, pp. 3–12, 31–35]. A criticism based merely on his use of abstract objects would therefore miss the distinction between an abstract language and the social relation of using it.

The strength of that distinction is methodological. An investigator can first specify an interpreted system precisely and then ask what makes it a system used by particular people. Precision about the first object need not pretend that the second is equally simple. This also shows why adding a temporal index to a GR representation is insufficient as a criticism of conventionalism. A sequence of use relations can already register change. The further question is what warrants treating that sequence as the career of one formation, or as a history connecting several formations.

Consider a constructed contrast. Two associations use the same technical vocabulary in otherwise different linguistic practices. Their members coordinate successfully in a limited activity. A precise interpretation of the shared vocabulary may explain that success. It does not yet determine whether the associations share a whole language, share a specialized convention, or exchange expressions across an acknowledged boundary. The issue concerns the scale and content of the unit that the investigator proposes. Enlarging the interpreted system can answer some such questions, but its enlargement requires linguistic and historical grounds; set-theoretic availability alone supplies none.

The paper therefore retains the separation between a represented structure and the conditions of its use. It adds no general objection to abstract representation. Its concern arises when an interpretation of the use relation is expected to support a stronger historical conclusion. A conventional account can attempt to supply that interpretation. A GR account must do the same. Neither receives an exemption merely because its preferred vocabulary already contains social activity, history, or relations.

2.3 Historical Practices

Jackman's alternative directly addresses shared language as a particular cooperative practice. He argues that participants can share such a practice despite unequal command of its expressions, and that structurally matching but historically unrelated practices need not constitute the same shared language. His criticism of Lewis turns on conceptual autonomy and the explanation of participation, while his starting assumption that shared language is possible remains explicit [13, pp. 295–309, especially p. 304 and n. 1]. The proposal is an important predecessor to the present historical question.

The philosophical gain is that difference within a formation need not be an approximation to an otherwise uniform object. Differentiated participation can help constitute the activity being explained. Yet that gain also creates a boundary obligation. People can cooperate in correcting translations across

languages; specialists can assist outsiders; and a multilingual institution can sustain shared routines. The existence of mutual assistance therefore does not, without further premises, identify the relevant whole-language unit. A practice must be characterized sufficiently to distinguish participation in it from an interaction that connects it with another practice.

This is not an objection to historical particulars as such. A river can receive tributaries without becoming every body of water with which it is causally connected; the analogy illustrates a logical requirement, not a proposed natural-kind theory of language. Historical dependence must specify the relevant mode of connection. In linguistic inquiry, the distinction can involve the continuation of a standard of use, the uptake of an inherited expression, the reproduction of an interpretive capacity, or the maintenance of an institution. These connections can support different units. Their divergence is an object of investigation rather than an immediate contradiction.

Ridge's discussion makes a related limit explicit. His language analogy distinguishes historically embedded practice from fine-grained structural identity, but he leaves the criterion for a new language within a lineage largely open. He tentatively considers whether earlier usage remains relevant to present correctness; his principal inquiry concerns games [18, Secs. 2–3]. That suggestion is useful here as a question to test, not a sufficient criterion to inherit.

Present orientation toward earlier usage can have several meanings. Participants may consult earlier material as a binding precedent, an optional resource, an object of scholarly interpretation, or something deliberately to revise. These relations provide different evidence. A practice can continue while disputing an inherited standard, and an otherwise separate practice can treat an earlier source with great authority. The current paper consequently asks which historical connection is being asserted before deciding what present recognition demonstrates. It does not infer sameness from the mere fact that the past matters.

2.4 Standardized Language Boundaries

Kloss distinguishes language status grounded in linguistic distance, *Abstand*, from status grounded in deliberate development into a standardized literary medium, *Ausbau*. The categories can overlap. He also distinguishes separate developed languages from multiple centers of one standard, and treats the relationship as historically changeable. His article explicitly sets aside the problem of measuring linguistic distance rather than deriving a complete metric or decision procedure [14, pp. 29–34]. The distinction thus supplies a more specific predecessor to the separation of structural comparison from organized standardization.

Its importance for the present inquiry is explanatory. Two standards can be maintained separately within a closely connected history, while several institutions can maintain variants of one standard. Counting institutions would not distinguish those possibilities. Counting structural differences would require an account of their significance. Consider a stipulated case in which two publishing organizations initially adopt a common standard and later develop different terminologies. Separate institutions and selected differences are now present, but the investigator still needs to examine whether each organization's practices refer corrections back to a shared standard, sustain independent standards, or combine both arrangements across domains. The institutional and structural evidence becomes informative through the relations it supports.

The distinction also sharpens a limit. A claim about standardization concerns a particular organization of linguistic practice; it need not exhaust the historical formation in which that organization develops. The formation can include oral or signed activity, dissenting practices, and participants whose uses are poorly represented by its written standard. Conversely, a change in the standard can be a consequential transformation within an evidenced lineage. The current paper therefore uses Kloss's distinction to identify competing grounds for a boundary while keeping their historical connection open to inquiry. Neither structural distance nor a separately maintained standard supplies, by itself, the complete witness for the lineage asserted. The effects and authority of standardization must also be investigated, which leads to the problem of representation.

2.5 Representational Authority

Gal and Woolard examine how representations of languages and publics acquire authority and help shape social life. Their introduction treats scholarly categories and linguistic ideologies as historically situated, and expressly distinguishes examining their effects from simply discrediting the categories [2, pp. 129–132]. This perspective shifts attention to an important complication: a classificatory boundary may participate in producing the organization it subsequently describes.

The complication has an immediate consequence for individuation. Suppose an institution first groups diverse practices under one name and then directs teaching, publication, and access around that grouping. Later convergence cannot by itself show that the initial classification faithfully described an already integrated language. It may partly result from the classification's implementation. Conversely, showing that a boundary was historically instituted does not establish that its later referent lacks organization. An explanatory account must distinguish the history of a name, the effects of its application, and the relations subsequently sustained. These are separate causal and interpretive questions.

Leonard's reclamation argument presses a further issue: community understandings of language can define the object of language work, rather than remain external preferences about a technically pre-determined object. His account also recognizes internal disagreement and the overlap between linguists and community members [16, pp. 17–21]. Treating the disagreement as a contest between homogeneous groups would therefore miss part of the argument.

For this paper, the challenge is to give participant descriptions epistemic standing without converting every description into an infallible boundary. A testimony can identify a constitutive relation that the investigator's categories omitted. It can also assert an empirical genealogy, a practical affiliation, or a demand for recognition. Those assertions need to be distinguished before their grounds can be assessed. Disagreement about descent is not automatically disagreement about the right to participate; disagreement about a grammatical feature is not automatically evidence that a participant's account of belonging is mistaken.

The GR translation faces a corresponding limit. An analyst might represent all these statements as events that affect later operations. That representation could be useful while still failing to address what the statements mean or whether their claims are warranted. Capturing a classification's causal effect does not establish its descriptive adequacy, and descriptive adequacy does not confer legitimate authority to impose it. A shared mathematical carrier cannot settle those differences by placing their records together.

2.6 Historical Boundary Warrants

The comparison supports a plural but constrained research task. Individual capacities, interpreted systems, shared practices, and named institutions can be investigated without assuming that one object exhausts language. Their coexistence nevertheless leaves hard questions. An investigator who identifies a historical linguistic formation must specify why selected relations constitute an explanatory unit, how that unit is followed through change, and what evidence would favor a competing delimitation.

This requirement is stronger than the claim that classification depends on purpose. A stated purpose can explain why a distinction matters; it cannot manufacture a historical connection or make irrelevant evidence decisive. If a boundary is proposed to explain the availability of interpretation, evidence that indispensable interpretive relations repeatedly cross it may require a different model of the boundary. If the purpose is to trace descent, current structural similarity may be informative while remaining insufficient. The adequacy of an answer depends on the relationship between its object, its question, and the history it claims to describe.

GR supplies inherited resources for articulating these obligations. Its prior metamodel already develops identity criteria, directed lineage, overlap, and evidence-sensitive boundary reconstruction [10]. Section 4 explains that inheritance and its representational status. The linguistic work required here is to interpret the selected relations, confront rival individuations, and assess the consequences of following one boundary rather than another. The next section develops the conceptual criteria needed for that assessment before introducing their formal representations.

3 Linguistic Formation Criteria

A historical linguistic unit requires an account of what belongs together and what kind of continuation is asserted. The literature establishes why neither question can be answered simply by choosing between an individual and a collective object. This section develops a preliminary conceptual specification of the proposed unit. It identifies the organization to be explained, separates several historical relations, and states what a boundary judgment commits its proponent to showing. These are conditions for making an individuation proposal assessable; they are not a complete empirical decision rule or an independent proof that every named language denotes one such unit.

3.1 Candidate Linguistic Formations

A *candidate linguistic formation* is a provisionally delimited historical organization of practices, capacities, material traces, and relevant relations of linguistic uptake. Calling it a candidate preserves the question of whether its proposed boundary is warranted. Calling it historical means that its present configuration is investigated through its formation and transformations, rather than exhausted by an inventory at one instant. The term does not require a single origin, continuous public activity, homogeneous membership, or a fixed institutional name. Nor does it imply that all the conditions on which the formation depends must be included as its constituent parts.

The qualification *linguistic* carries a substantive burden. A collection of causally connected events is not thereby a linguistic formation. The inquiry must identify how selected events participate in producing, interpreting, learning, correcting, recording, or otherwise sustaining meaningful linguistic activity. It must also explain the evidence for that interpretation. A signal can affect a hearer's behavior without being understood; an accurately copied inscription can circulate without remaining interpretable. The proposed formation therefore requires more than a map of physical influence. This requirement guides inquiry without purporting to supply a complete theory of meaning.

The formation can include heterogeneous participation. One person produces an expression, another understands it without using it, a third repairs a contextual misunderstanding, and a later participant draws on a recorded exchange. These are different relations to the activity, not necessarily incomplete copies of one uniform membership condition. A representation should retain whichever differences matter to its claim. Counting all four people as speakers would erase a relevant distinction if the question concerns production; excluding the latter three would erase relevant dependencies if the question concerns how interpretation becomes available.

The candidate also needs an analytical scale. A recurring interaction, a professional register, a regionally distributed practice, and a historically named language can each organize significant linguistic activity. Establishing the reality or explanatory usefulness of the first does not establish that it has the scale of the last. The paper therefore uses *formation* to permit investigation of the proposed organization while leaving its relationship to whole-language individuation open. A local unit can become evidence for a broader formation, but the enlargement requires an account of the connecting relations and the distinctions it retains.

This avoids two unhelpful starting points. Beginning with an official language name risks building the disputed boundary into the carrier of inquiry. Beginning with completely uninterpreted events avoids that particular presupposition but does not yet provide a linguistic object. A workable inquiry begins with revisable descriptions of situated activity and records how their interpretation supports a proposed formation. Its initial interpretation is a hypothesis accountable to evidence, rather than a claim to possess a neutral description before all interpretation.

3.2 Organizational Unity

The positive basis for treating a candidate as a unit is an organization relevant to the selected linguistic question. Organization here concerns patterned relations that make some activities possible, sustain them, or shape their transformation. A collection of mutually similar expressions need not exhibit this

organization. Conversely, differentiated expressions and capacities can participate in it. The claim becomes informative when the proposed relations explain a difference that would be lost by considering each selected component in isolation.

Consider a constructed example of a multilingual public workshop. Participants bring different competencies; some can interpret specialized expressions, others retain access to earlier records, and others can explain how an expression's application has changed. Their organized interaction supports an interpretive capacity that no participant possesses independently. This warrants investigating a distributed organization. It does not yet warrant counting the workshop as one language. The whole-language conclusion would require additional grounds connecting its internal distinctions to the proposed language boundary. The example distinguishes evidence for a relational unit from evidence for a particular linguistic scale.

An organizational explanation need not treat the unit as closed. The workshop can depend on an archive, a publisher, or an interpreter outside its recurrent membership. A boundary can remain useful when those dependencies are represented as interfaces. The problem arises when the investigator claims that the inside description is sufficient for a selected explanation while omitting an external relation that changes its answer. A revised representation can enlarge the unit, supply the missing interface, or narrow the explanatory claim. None of these options follows automatically from discovering a dependence.

This permits a careful distinction between constituents and supporting conditions. A relation is treated as constitutive when it belongs to the organization whose identity or operation is being characterized. A supporting condition enables that organization under the selected description without necessarily supplying its criterion of unity. The distinction is relative to a specified object and explanation; it is not a division of the world into intrinsically constitutive and intrinsically external things. An inscription can be a constituent of a textual practice while serving as one resource for a wider linguistic formation. A change in its material carrier can preserve one organization while transforming another. The earlier GR preservation taxonomy provides the general distinction among objects, capacities, conditions, and historical continuation that this application uses [12].

Constitutive organization also need not remain materially identical. If a practice changes the means by which corrections circulate, the change may reorganize a relation that continues to perform a relevant role. An account of continuity must show how the later organization develops from the earlier one and which difference is permissible under the asserted mode of continuation. It cannot assume that replacement is either complete disappearance or complete preservation. The point of identifying an organization is to make that comparison possible.

3.3 Constituent Roles

The distinction between organization and supporting condition needs a more specific argument if it is to constrain individuation. A causal contribution can be indispensable without belonging to the organization whose continuation is being followed. Conversely, a replaceable component can occupy a constitutive role. Necessity and replaceability therefore cannot supply a general boundary rule. The inquiry needs to explain the kind of contribution and the object relative to which it matters.

Consider a stipulated practice in which participants consult annotated earlier uses when a disputed expression arises. The notes record examples, the participants know how to locate them, and the consultation can change the interpretation accepted in the encounter. For a question about this practice's organization of correction, the consultation relation belongs to the process being explained. It connects present disagreement with resources that the participants treat as relevant. The physical binding of the notebook may be replaceable without loss of that relation. What the account retains is neither an isolated artifact nor its bare necessity, but an organized role carried by participants, records, and their historically acquired use.

Suppose the same room's heating system permits the consultation to occur during cold weather. Its contribution is real, and its failure could terminate the meeting. Yet the selected explanation of how a disputed use is assessed can treat heat as an enabling condition without making the heater part of the correction practice's individuating organization. This judgment is warranted only at that scope. An inquiry

into the relocation of the entire winter teaching arrangement may have to include heating provision, access, and maintenance. The distinction changes because the question and represented organization change, not because the material component acquires a different intrinsic metaphysical category.

Two constraints prevent this flexibility from becoming unrestricted choice. First, inclusion must identify the component's organized contribution to the selected linguistic activity. A shared funder cannot establish a common correction practice unless the funding relation also helps explain the linguistic organization claimed. Second, exclusion must leave an adequate account of relevant dependence. If access to the annotated examples determines which interpretations can be assessed, an account that excludes the archive must preserve that access as an interface condition. It cannot retain the explanatory benefit of consultation while omitting the relation through which consultation becomes possible.

These constraints admit two adequate descriptions in some cases. An expanded formation can include the records and consultation procedure. An open practice can retain its participants as the focal region and expose access to the records as a boundary input. The descriptions then make different explanatory commitments. The expanded account undertakes to describe the consultation's organization; the open account conditions its claims on an appropriately specified input. A declaration of externality is therefore a limit on what the latter account explains. It does not explain away the dependence.

This relation between constitution and explanation is especially important when the paper speaks of a linguistic formation. A formation is not obtained by collecting everything causally relevant to language use. It is proposed by identifying a historically organized pattern of linguistic participation and showing why tracking that pattern matters. The proposal can fail because the claimed organization is unsupported, because its scale exceeds the relations established, or because its supposedly constitutive role does not work in the stated characterization. Those possibilities make the concept answerable to inquiry while allowing more than one warranted boundary.

3.4 Joint Relational Individuation

A relational criterion encounters another difficulty before its boundaries can be assessed. Identifying a relation usually requires identifying its participants. Identifying participants by their relations can in turn appear to require the relation already to be settled. A teaching link, for example, cannot be treated as an independently given edge if the investigator remains uncertain whether two names refer to one teacher. The inherited metamodel therefore permits joint reconstruction of appearances, participants, and incidence rather than deriving one unconditionally from the others [10, pp. 30–31].

A small documentary case gives the difficulty a concrete form. Suppose two course records each name a mentor as Mara. One reconstruction identifies a single person working across the courses. Another identifies two people with the same name. Under the first reconstruction, the records may support a cross-course mediation relation. Under the second, the names supply no such relation. Joining the records because the courses are assumed to share a language, and then using the resulting mediation to prove that unity, would protect the proposed boundary by its own premise.

The records can nevertheless constrain the reconstructions. A dated account of the mentor moving between the courses, a participant's situated testimony, or a correction note explicitly referring back to the other encounter can bear on the identification. Their force depends on reliability, interpretation, and the possibility of contrary evidence. The relevant independence is modest: the reason for joining the appearances must not consist solely in the language grouping that the joining is later used to establish. It need not be an uninterpreted fact independent of every background assumption.

Figure 1 shows the two assignments while holding the named records fixed. The left assignment supplies a shared participant; the right preserves two participants. Neither diagram by itself supplies the mediation relation that the inquiry seeks to assess.

Even identification of one mentor leaves a further issue. The person may teach two separate repertoires without carrying interpretations between them. Personal continuity establishes neither a shared correction procedure nor the effectiveness of a mediating operation. A notebook connecting one course's disputed use to an explanation offered in the other would bear on that additional claim. Observations of

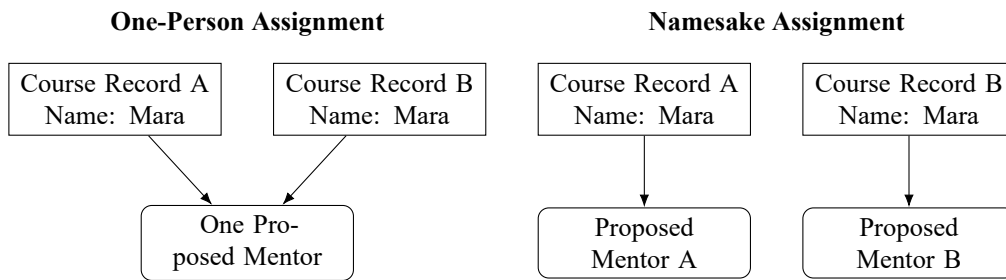


Figure 1: Candidate Participant Assignments. Arrows mean proposed reference from a record to a participant. The records are held fixed while the identity assignment changes. The arrows represent neither historical descent nor established teaching influence; evidence must assess those further relations separately.

learners using the explanation would bear on uptake. The successive inferential steps concern identity, relation, and consequence, and each can receive different support.

This example shows why joint reconstruction is more than permission to draw several networks over the same data. Competing assignments make claims about what particular records mean and which relations could have operated. A candidate can be rejected when it assigns one person to incompatible documented appearances without an adequate explanation, attributes a correction link where the record supports independent teaching, or erases a distinction required to understand an encounter. The rejection is relative to the evidential claims made, not a consequence of the candidate's departure from a preferred visual form.

Several assignments may survive. The investigator can then distinguish a common conclusion, such as the use of related instructional materials, from the assignment-dependent conclusion that one person mediated their interpretation. The shared conclusion is substantive even when a further boundary remains unresolved. Assigning an uncertainty label to the whole formation would lose this difference, just as assigning a definite language identifier prematurely would conceal it.

Relational individuation consequently works through reciprocal constraint. Provisional participants, encounters, and relations make candidate organizations intelligible. Evidence tests their assignments and can require the proposed unit to change. The process supplies neither interpretation-free atoms nor a final holistic object immune to local criticism. It supplies revisable commitments at several connected levels, each capable of being challenged for a specific reason.

3.5 Individuation Scales

The preceding arguments identify an organized process without automatically assigning it the scale of a language. Four judgments should therefore remain available separately. A useful aggregate groups records for a stated purpose. A coupled process retains relations through which the grouped activities condition one another. A historically reidentified formation connects different occurrences of that organization through a warranted continuation criterion. A whole-language claim further proposes that the resulting unit has the linguistic extent appropriate to that description. Each judgment adds a commitment rather than merely a more ambitious name.

The mentor example can satisfy the first two judgments while leaving the latter two open. Two records can be usefully compared, and a mentor can make their practices interact, without the evidence establishing sustained organization across a longer interval. If recurrent mediation and its historical transformations are then documented, a formation may become a warranted object. Its role could still be a specialized bilingual interface. Calling it one language would require an account of how its scope relates to the wider repertoires it connects.

This is a reason to keep scale inside the argument rather than treating it as a preliminary choice with no later consequences. A local mechanism can be fully explained while a whole-language boundary

remains underdetermined. Conversely, a well-supported historical language can include local practices that require different units for their explanation. A language-level description is adequate only for claims whose relevant organization and history it actually retains. The present paper investigates those obligations; it does not promote every successful local representation into evidence for a comprehensive language count.

3.6 Historical Connections

Historical individuation requires distinguishing several connections that ordinary continuity language can combine. *Resemblance* compares selected features of earlier and later activity. *Descent* asserts a historically relevant dependence of later activity on earlier activity. *Organizational continuation* claims that an identified practice or configuration persists through some transformation. *Recognition* concerns the ways participants or institutions identify those relations. These are descriptive distinctions in the present argument. Their formal counterparts require separately specified carriers and comparison relations.

Resemblance alone does not establish descent. Two records can exhibit a matching expression without the available evidence connecting their production. Descent alone does not establish present unity. Two successor practices can inherit a source while developing distinct standards and patterns of interaction. Recognition can support either claim, but its content must be established: a declaration of shared heritage need not assert identical current practice. Likewise, continued organizational influence need not mean that later participants accept the earlier practice's account of itself.

A historical witness specifies the connection that a continuation proposal relies on. In an empirical inquiry, this might involve documented transmission, a traceable sequence of copying and interpretation, or evidence that later participants reorganized an inherited practice. In a formal construction, a witness can be stipulated as part of the represented structure. The two uses must remain distinct. A mathematically supplied witness proves no empirical genealogy until there are grounds for interpreting its elements and relations as the relevant history.

The witness must also match the claim. A chain of copied documents can establish record descent without demonstrating that interpretive competence continued through the same chain. A pattern of recurrent teaching can support a transmission claim without demonstrating that the transmitted content remained unchanged. The inherited GR framework already separates directed lineage from identity and permits historical divergence [10]. Its application here requires stating which linguistic connection is retained and which conclusions its retention licenses.

Branching illustrates the need. Suppose two later associations both draw on earlier recordings, but use them in differently organized practices. The shared source supplies a possible common anchor. Evidence of actual uptake is still needed to connect that source to each practice. Even when both connections are established, the result may be two descendants rather than one undivided present language. Declaring the descendants identical because both are connected to the source would substitute an equivalence relation for a directional historical relation. Treating them as wholly unrelated would erase the very history the evidence establishes.

Interruption presents a different question. If one form of activity ceases, the investigator must identify what ceased and what persisted. Records, affiliations, forms of expertise, and possibilities of renewed uptake can have different histories. This distinction does not settle whether a later practice is the same language, a reconstructed successor, or another kind of continuation. It prevents a conclusion about one interrupted process from deciding all those questions in advance. The empirical cases later in the paper examine the evidence required for more specific claims.

3.7 Boundary Comparisons

A criterion of individuation states which differences a proposed unit is permitted to contain and which differences require another analysis. Its use is consequently stronger than reporting a collection of similarities. A grammatical comparison can group practices by a retained structural profile; an organizational comparison can group them by participation in a selected practice; a historical comparison can track a

declared lineage. These comparisons can legitimately produce different groupings because they retain different relations. The investigator must state when a grouping is also being offered as an account of a historical language.

Mutual intelligibility, for example, can be relevant to an explanation of accessible communication. Its assessment nevertheless requires a context, a repertoire, and a direction of understanding. Successful interpreted communication must first be distinguished from unassisted mutual intelligibility. A stipulated case makes the logical issue clear. One participant understands another through a specialized interpreter, while the reverse interaction proceeds directly. The interaction succeeds, but its success does not establish symmetrical competence or the absence of a boundary. Treating successful communication as a criterion without retaining the mediating arrangement would change what the evidence supports.

Interactional connectedness has a comparable limit. In a constructed network, one interpreter connects two otherwise distinct practices. Taking the connected component of every communication relation would group them together. That result follows from the investigator's choice of relation and closure operation. It does not establish that the resulting component is one language. The interpreter may be precisely the interface through which participants maintain a distinction. A relation can connect units while supporting their continued differentiation.

A common name raises the same issue in another form. Its use can coordinate expectations, direct resources, and influence subsequent practice. These effects make it part of a possible explanation. They do not establish that every practice receiving the name has the same organization, or that practices using different names lack relevant continuity. A description must examine what the name does, who uses it, and which relations are being asserted through it. Institutional reach cannot substitute for that interpretation.

These limitations do not make the criteria useless. Each can answer a well-formed question when its scope and evidential role are specified. A profile of structural features can clarify a contrast; an intelligibility inquiry can identify a practical obstacle; an institutional name can explain a pattern of affiliation. Their failure as universally sufficient criteria makes a coordinated account necessary. It does not require every study to combine every criterion or to assign them numerical weights.

3.8 Individuation Commitments

A defensible proposal should first identify its target: the formation whose boundary is at issue, the relevant historical extent, and the explanatory question. It should then identify the relations it retains, the mode of comparison or continuation it asserts, and the grounds for interpreting its records in that way. Finally, it should make clear what follows if the proposed boundary is accepted. These commitments are connected. A boundary introduced for a genealogical claim cannot silently acquire the authority to determine current competence or legitimate membership.

The resulting account admits plurality while retaining disagreement. Two descriptions may investigate different objects, such as an individual's computational organization and a distributed transmission practice. They may instead retain different aspects of one history for complementary questions. But they can also compete directly. If two proposals concern the same explanatory task and make incompatible assertions about a relevant dependency, both do not become adequate merely because each announces a purpose. Their evidence, omissions, and consequences must be compared.

Suppose a proposed regional unit is claimed to explain how a selected interpretation remains available. If the explanation depends on consultations systematically excluded from its description, that is a reason to revise the explanatory boundary or represent the consultations explicitly. The objection is grounded in the claimed process, not simply in another investigator's preference. Conversely, evidence of some external contact does not refute the regional unit unless the contact matters to the claim being made. This is how purpose can discipline explanation without deciding its answer.

Several warranted boundaries may still remain. A historical formation can participate in overlapping organizations, and the available evidence can leave more than one reconstruction viable. The appropriate response is to specify the supported alternatives and the claims common to them, rather than manufacture a unique answer. Unresolved plurality differs from unrestricted choice: an unsupported historical

connection remains unsupported, a missing interpretive bridge remains missing, and a represented dependency cannot be ignored while its explanatory consequences are retained.

The proposed criteria therefore establish obligations rather than a universal partition. They permit historically distributed linguistic units while requiring an account of their organization, continuation, and boundaries. Section 4 situates those obligations within the inherited GR framework. The subsequent formal constructions make selected comparisons precise; the later evidential and case discussions determine what those comparisons can support about actual linguistic formations.

4 Generative Relational Foundations

The preceding criteria identify several kinds of evidence that may support a linguistic unit. This section explains the GR conception of the object to which those criteria apply. Its task is philosophical before it is notational: to articulate how a formation can possess historically consequential organization without requiring a permanent substrate, and how such organization can be represented without allowing the representation to decide its own adequacy. The discussion develops manifestation, history-bearing spacetime, generative relations, and the division of work among formal tools. These foundations prepare the distinct constructions in the next three sections.

4.1 Relational Reality

The relevant prior GR distinction separates questions about ultimate ontological constitution, questions about effective relational organization, and questions about particular manifestations [6, pp. 17–19]. The first asks what a phenomenon ultimately consists in. The second asks how its organized relations participate in further events and transformations. The third concerns what appears or is recorded in a selected encounter. These are analytical perspectives; they are not three substances or three independently measurable quantities.

Applied to language, the distinction permits a limited but substantial claim. A practice of correction can organize what participants learn, which utterances receive uptake, and how later innovations are evaluated. Its efficacy need not depend on agreement about whether a language is fundamentally a mental object, an abstract system, a social practice, or some combination. The disagreement does not disappear. It can be suspended for an inquiry whose evidence concerns those organized consequences. Conversely, observing one successful exchange does not establish the wider practice's organization. The event could depend on prior preparation, a translator, a familiar script, or a relationship that will not recur elsewhere.

Relational reality in this sense is stronger than the assertion that everything is related to something. The investigator must identify a pattern of relevant dependence and show what explanatory work it performs. Suppose two groups possess similar word lists. In one, novice attempts receive interpretable responses and corrections that affect later usage. In the other stipulated case, the lists are stored but disconnected from any such activity. The retained lexical comparison can be identical while the organization differs. To explain the difference, an account needs relations among attempts, responses, participants, records, and subsequent opportunities. Listing the components alone omits the mechanism through which they matter together.

This argument does not make every effective organization a language. A transport network or an administrative hierarchy also organizes future possibilities. A linguistic interpretation must explain how the selected relations concern meaningful expression, understanding, uptake, learning, or the standards governing them. Nor does causal influence alone establish linguistic correctness. A powerful institution can impose a form that participants contest. The organization of uptake and the justification of a norm therefore remain distinguishable even when they interact causally.

For individuation, relational efficacy supplies a reason to take an organized formation seriously as an explanatory object. It does not provide an automatic boundary. Two activities can depend on the same institution without forming a single linguistic unit. A useful boundary must specify which organization

is being tracked and why its internal and external relations have the assigned roles. This is the point at which the general GR perspective meets the criterion-specific inquiry developed above.

4.2 Ontological Commitments

Ontological suspension requires a positive account of what the inquiry still commits itself to. Prior GR work acknowledges that claims about emergence, persistence, and causal participation presuppose occurrences and relations among earlier and later situations [6, p. 19]. Suspension withholds an ultimate substance-like guarantee; it does not turn every description into a fiction or remove the need to defend the existence of the events being described. A historical linguistic investigation can therefore assert that a teaching encounter occurred, that a record derives from it, or that an institution organized later access while leaving deeper metaphysical questions open.

The status of a formation depends on the content of the assertion. If an investigator claims only that a selected grouping is useful for arranging documents, its adequacy concerns that documentary task. If the grouping is said to identify an organization that sustained interpretation, the claim requires evidence for the relevant organization and its contribution. If it is said to identify one historically continuing language, a further individuation and continuity argument is owed. The representational flexibility of GR permits these claims to be stated together, but gives no reason to treat their evidential burdens as interchangeable.

This graduated commitment explains how a formation can be more than an arbitrary classificatory convenience without becoming a substance. Suppose a recurrent arrangement links questions, differentiated expertise, accessible examples, and responses that participants can use. Its reorganization can change which questions receive an intelligible answer, even when the same participants and documents remain. The explanatory contrast concerns how they are related. Describing that organization can therefore identify a feature of the history to which inquiry is accountable. The claim does not require another speaker existing in addition to the participants, or a collective mind that acts separately from their encounters.

An individual-and-interaction description may recover exactly the same organization. Where it does, the relational account need not compete for an additional causal contribution. Its value can lie in stating the organized dependency explicitly, retaining it across participant replacement, and making its transformations comparable. Whether that value warrants treating the organization as a separately individuated entity remains a substantive philosophical question. The present proposal licenses investigation of the formation at that scale; it supplies no general proof that every adequate explanation must quantify over one privileged class of collective objects.

Persistence likewise concerns an organization under a stated criterion. Replacing one mentor can preserve a teaching relation when the successor acquires the relevant responsibilities, materials, and practical connections. The same replacement can terminate the particular interpersonal relation through which an earlier learner acquired confidence. Both conclusions can be correct because the tracked objects differ. If the inquiry claims that the formation persists, it must identify what passes through the replacement and what changes. Merely observing that some activity continues leaves that question unanswered.

The position is consequently open to stronger realist, practice-based, and individualist interpretations. Those interpretations may disagree about the ultimate status of the formation while sharing some local historical claims. Agreement at that level is useful without dissolving their disagreement. GR functions as a framework for articulating the shared constraints and remaining commitments, rather than as a device for declaring the ontological debate resolved by a common notation.

4.3 Linguistic Interpretation

A second positive obligation concerns what makes the represented organization linguistic. The reality of a response, its regular recurrence, and its influence on later behavior can all be established while its interpretation remains disputed. A learner may repeat an answer because it is understood, because a familiar sequence has been memorized, or because an authority rewards that response. An account that records only the repeated answer cannot select among these explanations. The inferential problem

concerns the retained evidence, not an assumption that genuine understanding must always be verbally articulated.

Consider a stipulated expression used in a workshop to distinguish a temporary repair from a completed repair. One record contains repeated appropriate answers to a familiar question. A second records how participants respond to an unfamiliar example, explain or demonstrate the distinction to another participant, and revise an initial answer after the relevant condition changes. The latter record bears on a wider range of interpretive relations. Its additional content can support the proposed linguistic description by showing sensitivity to the distinction that the description attributes. It remains possible that the selected encounters overstate the participant's wider competence. The proper inference retains the task and conditions actually investigated.

Correction is especially informative when its role is examined rather than assumed. A response can identify a misunderstanding, impose a preferred expression, contest an institution's rule, or simply end an exchange. Its contribution depends on what participants take it to address and what subsequently changes. Evidence can include the sequence of repair, participants' explanations, contrasted cases, and the later use of the distinction. These routes may disagree. A declared rule can remain poorly reflected in use; recurrent successful use can exceed what a participant can explain explicitly. The interpretation should preserve those differences.

Prior GR work on normative formation already distinguishes recurrent regularity from the organization of judgment and permits a contested standard to remain consequential [3, pp. 7–8]. This is a useful analytical resource, with an important translation limit. That manuscript treats normative grammar as an analogy and supplies no complete theory of linguistic content. Its distinction helps the present paper ask what a correction is doing. It cannot establish that a particular response constitutes understanding, or that an institution's preferred use is linguistically or morally justified.

Organized disagreement can nevertheless provide positive evidence. Suppose two participants dispute whether a new case falls under the workshop's expression. They distinguish competing examples, acknowledge which earlier uses bear on the question, and can identify what would change their judgments. Their conclusions differ, yet the dispute retains a structured relation among expressions, examples, and proposed reasons. An account that registers only disagreement would omit this organization. Conversely, two participants can give the same answer after following unrelated cues; their convergence alone does not establish the same relation of understanding.

The result concerns the selected organization, not a sufficient criterion for one language. Translators can sustain precisely such a dispute across languages, and unequal competence can require asymmetrical assistance. Its relevance to individuation is that evidence of unity or differentiation must attend to the activity being organized. Agreement of outputs, participation in one dispute, and a shared linguistic formation are different claims. Positive interpretation supplies the connections needed to investigate them without pretending that a causal graph or a list of expressions already contains its own semantics.

4.4 History-Bearing Spacetime

A snapshot of participants and their current properties may be inadequate to that inquiry. The same currently observed competence can emerge through different teaching histories, documentary reconstruction, or independent innovation. Those differences can matter to claims of succession even when they do not affect the next observed utterance. Earlier events can also alter what a later exchange means: a correction by a long-standing mentor, an unfamiliar official, or a recently appointed successor can have the same words and different relational significance. The historical configuration must retain the distinctions required by the question.

GR's history-bearing spacetime language gives this requirement a positive form. The represented object includes situated occurrences, their relations, and the historical transformations through which the configuration is constituted. "Spacetime" here need not mean a smooth physical manifold or a universal clock. A linguistic inquiry may require ordered encounters, overlapping institutional settings, documentary derivations, and paths of participation whose relative timing is only partially known. Physical

location and duration may enter when relevant, but the representation must earn any metric or geometric structure it adds.

The field-theoretic GR manuscript represents selected histories through labelled two-complexes and anchored extensions [11, pp. 14–21, 46–57]. A two-complex makes different orders of incidence available: events, connecting histories, and higher incidence data can be retained according to an explicitly stated interpretation. It does not uniquely determine what a speaker, encounter, institution, or linguistic formation must correspond to. Assigning every speaker to a point would erase their history if the relevant question required it; assigning a historically extended configuration to a region can preserve more of the needed structure. The choice is justified by the inference it supports, rather than by a rule that every ordinary noun must always receive the same geometrical representation.

There is also a distinction between extending a represented history and changing its interpretation. New encounters can enlarge the retained complex. New evidence can revise an earlier label or reveal a relation omitted from it. A theory that preserves a documentary anchor need not freeze every evaluation of that anchor. Thus a history-bearing representation can retain the provenance of a record while allowing its linguistic significance to be reconsidered. Confusing those tasks would make historical fidelity incompatible with correction, although the two can support one another.

The same distinctions limit the use of a spin foam. A labelled two-complex becomes a spin-foam representation only after the additional mathematical data appropriate to that construction have been supplied. Such an instantiation may be useful for a different investigation of generated histories or amplitudes. The present problem does not justify assigning those data merely because earlier GR work explored them. The source's separation of substrate combinatorics, mathematical invariants, accessible observables, and linguistic interpretation remains binding [7, pp. 5–6].

4.5 Historical Explanatory Roles

History enters the account in several ways whose differences matter to individuation. A formation history can explain how a present capacity developed. An inherited relation can remain operative within a current encounter. A documented derivation can warrant a lineage claim even when its participants do not recognize that derivation. These roles can coincide, but present causal influence should not become a universal test of every historical claim. The metamodel likewise separates current efficacy, formation history, and reidentifiable continuity [10, pp. 30–31].

Suppose two present teaching materials match on the expressions and exercises selected for a short performance test. One is a documented descendant of an earlier practice. The other was independently assembled to reproduce the same selected forms. The test may support the same prediction for both materials. It does not remove their difference in derivation. A genealogical inquiry retains that difference because descent is its object, even if no current learner knows the provenance or responds differently because of it.

Now add the stipulation that participants consult the first material partly because they regard its inherited provenance as authoritative. Its history then also bears on the present organization of correction. The account must establish the relation through which provenance becomes consequential; a researcher's knowledge of derivation alone does not establish participants' deference. The historical and current explanatory claims remain separable even when both are supported.

An origin narrative gives the converse case. Participants may organize their practice around a belief that their materials descend from an admired teacher, while documentary evidence shows independent construction. The belief's effects can be relationally real, and its asserted genealogy can be false. Retaining both facts is essential. Treating efficacy as sufficient historical warrant would validate the genealogy by its influence; treating the false genealogy as proof that no organization exists would discard the history actually formed around the belief.

The individuation consequence is therefore selective. A short prediction task can abstract from provenance. A current organizational account must retain historically mediated significance where it affects the selected activity. A lineage account needs an adequate witness whether or not that witness is currently recognized. A historically extended formation can coordinate these inquiries, provided that its

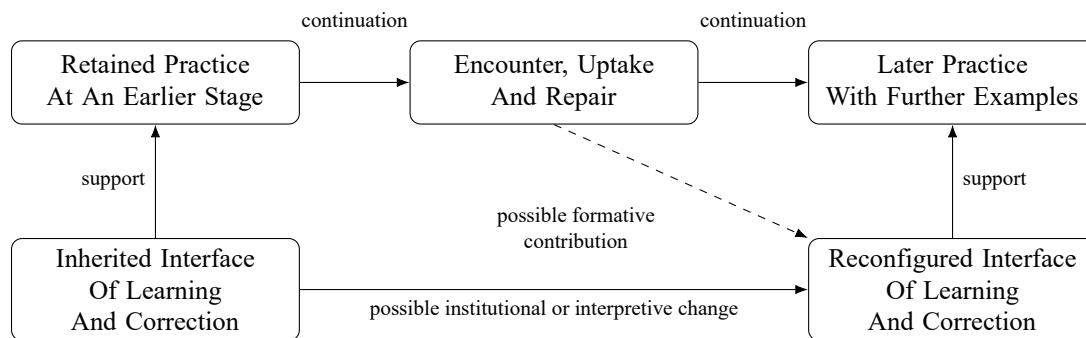


Figure 2: A Stipulated Historical Configuration. Solid arrows distinguish continuation from support as labelled; the dashed arrow marks a possible contribution of an encounter to later interface reconfiguration. The boxes are historically situated configurations, not measurements or an empirical network.

representation distinguishes which relations perform which role. Collecting the three under the word history without those distinctions would obscure the explanatory gain.

4.6 Generative Organization

The historical account would remain incomplete if it treated a language only as a collection of past events. A formation can support new utterances, interpretations, learners, and standards that were not individually present in its earlier record. The relevant generativity is therefore not exhausted by the reproduction of a list of outputs. The question is how earlier organization conditions further meaningful activity, including activities that modify the conditions of continuation themselves.

A stipulated teaching encounter illustrates this recursive possibility. A novice produces an unfamiliar expression. A mentor's response may correct it, accept it locally, or initiate discussion with others. Subsequent uptake can turn a tolerated novelty into an example used to teach later novices. The sequence changes more than a current utterance: it may change what counts as an available example, who can authorize a correction, and which comparisons participants regard as appropriate. The organization that enables the event can itself be altered through the event. GR's inherited investigations of generative reconfiguration provide resources for representing this feedback [11, pp. 52–57].

This account leaves the linguistic explanation open at important points. Grammar may explain why an expression is producible; a convention account may explain coordinated expectations; a historical-practice account may explain deference to earlier uses; institutional analysis may explain whose correction has consequences. Translating each into a history-bearing configuration does not replace those explanations. It makes their proposed interfaces available for comparison. The GR task is to identify where one account's output becomes another account's condition, and where that proposed connection lacks warrant.

Figure 2 separates three kinds of connection that a compressed narrative can conflate. The horizontal arrows represent a stipulated historical sequence. The vertical arrows represent dependence on a supporting interface. The lower sequence allows that interface itself to change. No arrow asserts that the depicted process occurs in every language, or that the influence is unidirectional in a more complete model.

The diagram's significance for individuation is selective. A change in the support interface need not terminate the formation. It can instead be part of its continuing history. Yet an account that ignores that change may falsely attribute later success or failure to the retained linguistic material alone. The criterion must therefore state whether it follows a profile, a continuing practice, a lineage, or some conjunction justified for its purpose. No universal requirement to preserve every relation follows.

4.7 Formal Continuity

The earlier GR metamodel introduces mechanisms acting on a carrier and examines their effects on a declared equivalence [4]. Its collapse results concern distinctions relative to that equivalence under specified operations. They should not be read as proving that every irreversible event destroys identity, or that an invertible history is not a history. Part II develops the further distinctions needed here: indexed appearances, historical lineage, continuing entity criteria, and continuation-sensitive descriptions [10, pp. 26–30].

In particular, Part II already shows why forward reachability need not produce an identity partition and why identifying both branches with a common predecessor has consequences if identity is represented by an equivalence. It also distinguishes a behavioral signature from a historical token. The present paper inherits these results. Its linguistic application asks which features a comparison retains, how a historical witness is supported, and when a boundary obscures the dependencies required by a selected explanation.

The field and algebra constructions serve complementary parts of that task. A regional field specifies how local data, restrictions, and interfaces fit together. A dynamical law specifies how an admitted configuration can change. An operation algebra can record composition and the distinctions observable through selected transformations. The direction of a configuration update differs from the direction of its action on observables, and partial operations require their availability conditions to remain visible. None of these structures can be obtained merely by calling a social relation a field or an operator.

A particularly useful diagnostic follows from taking the proposed boundary seriously. If an investigator claims that a retained regional record is enough to determine a selected continuation, then configurations with the same record must agree about that continuation's availability and retained outcome. An omitted interface can defeat this claim. The response need not be unlimited boundary expansion: the model can instead declare an input through the boundary. The choice between an enlarged object and an open-system description is itself part of the explanatory proposal.

4.8 Interpretive Responsibilities

These foundations establish a method of coordinated inquiry rather than a complete theory of linguistic identity. Historical records constrain what lineages can be asserted. Linguistic analysis constrains which differences matter to the explanatory target. Formal results constrain what follows from the chosen maps and relations. Participant accounts constrain the interpretation of practices and names, without automatically settling every historical or predictive question. Normative argument evaluates recognition, authority, and obligation when those questions arise.

Each contribution has a remainder that the others cannot simply absorb. A mathematical quotient can be well defined while grouping together records that participants distinguish for sound historical reasons. A participant's continuity claim can be significant evidence while leaving its documentary basis open to investigation. An empirically successful model of a narrow interaction can remain silent about legitimate representation. The GR metalanguage is useful when it keeps those relations and remainders explicit. Its success is assessed by the explanatory and critical work thereby made possible, not by the number of domains translated into common symbols.

5 Historical Comparison Structures

Historical language individuation requires a comparison architecture that permits an inquiry to distinguish resemblance, continuity, overlap, and branching. These relations answer different questions even when they concern the same practices. The present section specifies their carriers and gives the assumptions under which they support a classification. Its formal resources are inherited: the GR metamodel already separates entity reidentification from behavioral equivalence and directed lineage, while the preservation taxonomy supplies historically typed witnesses and partial comparison maps [10, pp. 26–31][12, Sections 3 and 9]. The task here is to apply that architecture to linguistic formations without deciding

their boundaries through the initial choice of a language label. The resulting constructions make an individuation claim inspectable. Their adequacy depends on the linguistic interpretation and evidence developed elsewhere in the paper.

5.1 Candidate Historical Regions

A linguistic practice can retain earlier interactions through learned distinctions, recurrent expectations, documentary materials, and institutions that affect subsequent use. A representation adequate to such a question must retain the relevant history, although it need not represent every occurrence. Following the existing GR spacetime construction, let the selected carrier be the labelled complex in Equation 1.

$$K = (V, E, F, \partial, \lambda). \quad (1)$$

The sets V , E , and F contain retained vertices, edges, and faces; ∂ specifies incidence and attachment; and λ assigns the application-defined labels. Finite or locally finite carriers are sufficient for the constructions below. An event of correction, a recurrent interaction, or an institutional linkage can motivate different cells or labels. Their interpretation is supplied by the investigation rather than fixed by cell dimension. Equation 1 represents selected historical relations; it supplies neither a physical geometry of language nor a proof that linguistic being ultimately has cellular form [11, pp. 15–18].

Historical precedence is additional structure. Let $\text{Ev}(K) \subseteq V$ be the vertices treated as events, and let $\preceq_K$ be a declared partial order on them. Incidence alone need not determine this order. In a regime admitting a slice Σ , represented by an event antichain, the retained antecedent event domain is stated in Equation 2.

$$D_K(\Sigma) = \{v \in \text{Ev}(K) : v \preceq_K s \text{ for some } s \in \Sigma\}. \quad (2)$$

The representation $K_{\leq \Sigma}$ includes the incidence-compatible cells and labels selected around this domain. Equation 2 permits incomparable events and overlapping activities. A calendar coordinate can be added when warranted, but the present comparison does not require one primitive scalar time for every linguistic relation.

Let $\mathcal{R}(K)$ be the admitted family of regions. A region can be a subcomplex or another explicitly specified retained part of the representation. Whenever intersections or unions are used below, their existence within the selected region family is an assumption. Two regions can share interaction histories, participants, artifacts, or interfaces without either exhausting the other. An institutional border or an official language name therefore need not supply the region boundary. Such a boundary is a candidate to be evaluated against the inquiry's purpose.

The initial comparison carrier $\mathcal{L}$ consists of indexed candidate formation records. A record $L \in \mathcal{L}$ specifies a represented historical carrier, a supported region R_L , and the retained linguistic evidence or hypothesized organization at that region. Its index distinguishes appearances or source records that would otherwise receive the same description. Membership in $\mathcal{L}$ means that the record is being investigated as a candidate linguistic formation. It does not establish that the region is one language, that every participant shares a grammar, or that the formation is independent of neighboring regions. The metamodel's warning about circular appearance domains applies directly: a carrier defined in advance as all occurrences of one already identified language can organize that identification, but cannot independently derive it [10, pp. 26–27].

This provisional construction nevertheless has positive content. The record can include recurrent interpretation, correction, transmission, and coordination relations that a claim of linguistic unity seeks to explain. The inquiry can compare two candidate boundaries while retaining the same underlying interaction evidence. Disagreement then concerns which organization is adequately represented, rather than whether one can invent a set containing the selected materials.

5.2 Criterion-Relative Profiles

An individuation criterion selects the distinctions relevant to an inquiry. A study of a grammatical pattern, a historically connected practice, and an institutionally recognized language may retain different content.

Let κ name the declared criterion, including its resolution and interpretation. Its profile extractor has the type in Equation 3.

$$e_\kappa : D_\kappa \longrightarrow Z_\kappa, \quad D_\kappa \subseteq \mathcal{L}. \quad (3)$$

Here D_κ contains the candidate records for which the retained comparison is meaningful, and Z_κ is a declared common carrier of profiles. The extractor can retain a structured collection of distinctions, interaction roles, or operation responses. It need not return a scalar. Comparison across differently represented histories requires justified alignments before both records can be placed in this common carrier. Equal written codes are insufficient to establish that alignment.

An operational model needs an explicit connection to these candidate records. Let Ω be a carrier of represented configurations and let $\beta : D_\beta \subseteq \Omega \rightarrow \mathcal{L}$ construct the candidate record associated with a configuration under the boundary being investigated. Equation 4 defines the sector on which the criterion supplies an operational profile.

$$\Omega_\kappa = \{\omega \in D_\beta : \beta(\omega) \in D_\kappa\}, \quad q_\kappa = e_\kappa \circ \beta : \Omega_\kappa \longrightarrow e_\kappa(\beta(\Omega_\kappa)). \quad (4)$$

The record construction in Equation 4 is an application commitment. It can retain a regional history, a current realization and their asserted linguistic interpretation; it does not follow from a configuration's numerical coordinates alone. The later operational analysis can take a nonempty Ω_κ as its admitted carrier and abbreviate q_κ by q . Failure to construct an applicable record remains distinct from an operation failing within that carrier. An operation that leaves the admitted sector requires either an explicitly bounded restriction of the task or a separately interpreted exit record. Refining q to carry an operation adds a responsibility to this selected description. It does not, by itself, establish a refined criterion of language identity.

For an exact profile comparison, Equation 5 defines the induced relation.

$$L \approx_\kappa M \iff e_\kappa(L) = e_\kappa(M), \quad L, M \in D_\kappa. \quad (5)$$

Equality makes $\approx_\kappa$ an equivalence on its stated domain. Equation 5 therefore supplies a partition of the applicable records. It is a partition by the retained profile, and its classes should be named accordingly. Calling those classes languages requires a further argument that the criterion captures the linguistic unit relevant to the question. The notation itself establishes only the comparison it was constructed to establish.

Definition 5.1 (Applicable Linguistic Profile Comparison). An applicable linguistic profile comparison consists of two records in D_κ , their extracted profiles, and the declared relation on Z_κ used to compare them. An exact profile classification uses Equation 5. A directional or approximate comparison retains its own relation type and assumptions.

Definition 5.1 preserves the difference between a negative result and an unavailable comparison. If a record lacks the evidence or articulation required for membership in D_κ , the profile comparison remains unresolved at that criterion. A failed comparison between two applicable records supplies a different conclusion. The preservation taxonomy makes the same distinction through partial applicability; the present application uses it to prevent missing linguistic evidence from being coded automatically as difference [12, Section 3.6].

Approximate similarity requires particular care. A tolerance-based relation can be symmetric without being transitive. For example, three profiles on a declared metric scale can place the middle profile within tolerance of each endpoint while the endpoints exceed the tolerance. Taking equivalence closure then introduces additional identifications. That operation can be a deliberate classification rule, but it does not merely report the original similarity tests. This issue arises before any normative question about whose classification should govern.

More than one justified criterion can be retained. If κ and κ' apply to a common domain, their joint profile records both values, and equality of the joint profile is the intersection of their two equivalences. This elementary construction supplies a more discriminating description. It does not decide

which criterion is constitutive of linguistic identity or whether their requirements deserve equal weight. A directional lineage claim, in particular, cannot be converted into an exact profile equivalence without changing its logical role.

5.3 Historical Continuation Witnesses

Historical continuation connects a later formation to an earlier one through a warranted relation. Its evidential resources can include continuing interaction, transmission, relocation, documentary derivation, and other forms of historical dependence. Let h specify the kind of connection being investigated. The witness family and its induced existence relation are stated in Equation 6.

$$\eta \in \text{Hist}_h(L, M), \quad L \rightsquigarrow_h M \iff \text{Hist}_h(L, M) \neq \emptyset. \quad (6)$$

A witness in Equation 6 is an explicitly typed tracking or provenance structure. Its meaning depends on h . A transmission witness need not establish complete grammatical retention; a reconstruction witness need not establish uninterrupted active practice. The distinctions are already developed in the preservation taxonomy [12, Section 9].

A stipulated witness establishes a relation inside the model. Attributing that witness to actual practices requires historical evidence supporting its endpoints, intermediate relations, and declared mode. A diagrammed arrow cannot supply this evidence. Conversely, incomplete evidence need not show that no historical relation existed. The formal witness and the warrant for accepting its empirical application therefore remain distinguishable throughout the argument.

In a selected anchored-extension regime, a witness can include an incidence-compatible embedding $\iota : K^- \hookrightarrow K^+$. The superscripts identify an earlier retained historical carrier and a successor representation. The model must state which labels and relations the embedding preserves. The entire later configuration can change while the selected anchor remains recognizable. In particular, later evaluations of historical materials need not remain fixed merely because the old occurrence structure is retained [11, pp. 46–51].

When successive witness types are composable and the admitted family is closed under that composition, witnesses from L to M and from M to N supply a witness from L to N . This is a conditional transitivity statement. It does not supply a reverse witness, and heterogeneous witness modes may require a separately specified composite mode. A reconstruction followed by ordinary transmission should not silently become uninterrupted transmission across the reconstruction interval.

The independence of profile comparison and continuation is already explicit in the metamodel and taxonomy [10, pp. 29–31][12, Section 9.1]. Its linguistic consequence is substantial. Two independently formed practices can agree under a selected response profile while the available evidence supplies no continuation witness between them. A continuing practice can change that profile through migration, correction, or altered interaction. A criterion equating continuation with profile invariance would classify those changes as termination by stipulation. Such a criterion can be examined, but it should not be mistaken for the neutral meaning of historical identity.

Example 5.2 (Matching Profiles With Different Historical Relations). Take records L_0, L_1, L_2 with a documented witness from L_0 to L_1 and no declared witness connecting L_2 to that lineage. Let the selected profiles be $e_\kappa(L_0) = a$ and $e_\kappa(L_1) = e_\kappa(L_2) = b$, with $a \neq b$. The continuing pair has different profiles, while the profile-matching pair lacks the required historical link. The construction represents a stipulated comparison, not an empirical assertion that two actual languages have identical structures.

Example 5.2 exposes the information needed by the two claims. Improving the profile’s descriptive precision can alter which records it groups. Establishing continuation requires historical evidence of the appropriate kind. Neither task is completed by renaming the other.

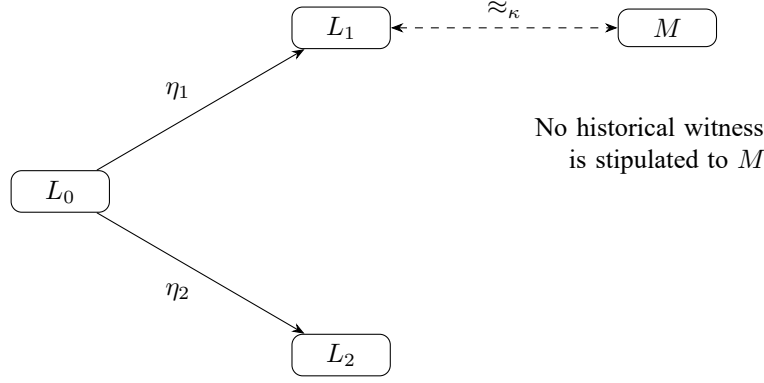


Figure 3: Historical branching and profile comparison in a constructed record system. The two solid arrows represent continuation witnesses from one predecessor. The dashed relation represents equality under a selected profile criterion; it supplies no historical witness.

5.4 Historical Configuration Relations

Two candidate formations can overlap in the practices or historical material they retain. Where the regions inhabit a common represented carrier, define supported overlap by Equation 7.

$$L \bowtie M \iff R_L \cap R_M \neq \emptyset. \quad (7)$$

Equation 7 requires an interpretation of the shared cells or records. Shared participation, a shared institution, and a shared correction practice are different kinds of overlap. Their extent cannot be read from one undifferentiated count. For carriers not already aligned, an overlap claim needs comparison data before an intersection notation is meaningful.

Even exact support overlap need not be transitive. Three admitted supports can have retained event sets $\{a, b\}$, $\{b, c\}$, and $\{c, d\}$. The first overlaps the second and the second overlaps the third, while the endpoints are disjoint. Their connected union can be useful as an interaction domain. Treating it as one language, however, requires an argument about the significance of the connecting relations. Connectivity is a mathematically available grouping rule; it cannot supply that argument by itself.

Branching presents a related issue across history. Suppose L_0 has independently warranted continuation witnesses to L_1 and L_2 . Their shared predecessor does not force the two successors into one individuation class. The following inherited elementary result makes the relevant constraint explicit [10, p. 29, Proposition 7.4].

Proposition 5.3 (Equivalence Constraint On Branch Identification). *Let E be an equivalence on a candidate-record domain containing L_0, L_1, L_2 . If L_0EL_1 and L_0EL_2 , then L_1EL_2 . Consequently, a classification that separates the successors cannot identify both with the predecessor within that same equivalence.*

Proof. Symmetry gives L_1EL_0 . Transitivity with L_0EL_2 gives L_1EL_2 . The final consequence is the contrapositive of this implication for a classification that declares the successors distinct. $\square$

Proposition 5.3 does not prescribe a privileged successor. It states the consequence of choosing equivalence as the relation type. An inquiry can retain both lineage arrows, classify the successors differently, and leave numerical identity unsettled. It can also defend a particular identity criterion that favors one branch or terminates the predecessor's identity. The historical graph alone does not choose among these interpretations.

Figure 3 distinguishes the arrows needed for these comparisons. Solid arrows record stipulated historical witnesses; the dashed relation compares selected profiles. The visual separation prevents a profile match from being read as a genealogical arrow.

Structure	Retained Information	Additional Individuation Burden
Profile equivalence	Equality of a declared linguistic record	Justify the profile’s relevance to the proposed unit
Historical witness	Typed continuation or provenance	Establish the witness and the significance of what continues
Support overlap	Shared represented activity or history	Explain whether shared material integrates the candidate formations
Branch relation	Several successor routes	Coordinate successor plurality with the chosen identity criterion
Regional organization	Internal relations and interfaces	Test which omitted surroundings affect the explanation

Table 1: Comparison structures relevant to historical language individuation. Each structure retains information that another can omit.

Merger requires corresponding care. If distinct earlier formations contribute to one later arrangement, the record can preserve multiple provenance routes without retrospectively identifying the earlier formations with each other. The current paper therefore retains histories of contribution and branching as relations among candidate units, alongside any criterion that groups appearances into identity classes. That arrangement accommodates continuity without requiring one globally disjoint partition to perform every analytical task.

5.5 Revisable Individuation Commitments

The formal constructions support an individuation specification with a clear division of labor. The candidate carrier states which records are being examined. The criterion states which linguistic distinctions are retained. Historical witnesses supply the kind of continuity claimed. Overlap and branch relations preserve relations among candidates that a partition might suppress. Evidence and explanatory purposes determine which of these constructions is warranted in a particular inquiry. A long tuple of labels would add little unless each component had first acquired this role.

Table 1 assembles these responsibilities. Its entries are comparison roles, not competing definitions from which one universal winner must be selected.

An inquiry can revise a boundary after discovering that an excluded correction setting or interpretive interface affects the selected linguistic activity. It can also retain the boundary while changing its description from an autonomous unit to an open formation with specified external inputs. Those options differ from simply merging all interacting practices. Interdependence supplies a question about explanatory organization; it does not imply that every dependency belongs inside the same linguistic individual.

Section 6 develops this point through a regional field construction and an explicit interaction law. Section 7 then tests when a retained record supports the operations assigned to it. These developments do not replace historical witnesses with dynamic behavior. They examine whether a chosen boundary and profile preserve the distinctions that the proposed explanation requires.

6 Regional Generative Fields

A proposed linguistic boundary can retain recurrent responses while excluding the relations that explain their continuation. Regional field constructions make this possibility precise by distinguishing local data, their linguistic interpretation, and the operations that change them. This section first introduces the required regional architecture, then supplies an explicit interaction model on a spatially distributed carrier and its growing history. The model identifies a conditional failure of autonomous regional description. It does not require every linguistic formation to be autonomous, and it does not decide which empirically

identified practices constitute a language. The regional realization, compatibility, and transport architecture is inherited from the GR field formalism; the present investigation uses it to examine the explanatory consequences of a selected linguistic boundary [11, pp. 27–39].

6.1 Regional Linguistic Realizations

Fix a represented historical carrier K and its admitted region family $\mathcal{R}(K)$ from Section 5.1. For each region R , choose a carrier $\mathcal{F}(R)$ of local field data. These data can represent structured distributions of linguistic responses, correction relations, transmission dependencies, or interface conditions. Calling the assignment a field does not give it a physical dimension, a linear value space, or a probabilistic interpretation. Each of those structures requires a separate reason and specification.

When $S \subseteq R$, a restriction must explain how the retained data over R produce the data over S . Equation 8 states the type and composition requirement.

$$\rho_{RS} : \mathcal{F}(R) \rightarrow \mathcal{F}(S), \quad \rho_{RT} = \rho_{ST} \circ \rho_{RS} \quad (T \subseteq S \subseteq R). \quad (8)$$

For partial restrictions, the second equality in Equation 8 includes equality of the declared domains, or is explicitly restricted to a common admissible domain. The identity restriction is also required. Restriction need not mean deleting entries from a vector: an institutional role or an interpretive distinction may require a context-sensitive reduction. The model must state when such a reduction is meaningful.

The mathematical data acquire a linguistic role through a realization map. Let $\mathcal{B}(R)$ denote a declared carrier of regional linguistic records, with its own restriction r_{RS} . The compatibility obligation is Equation 9.

$$\Xi_R : \mathcal{F}(R) \rightarrow \mathcal{B}(R), \quad \Xi_S \circ \rho_{RS} = r_{RS} \circ \Xi_R. \quad (9)$$

Equation 9 is imposed where both compositions are applicable. It asks whether restricting a formal datum and then interpreting it agrees with interpreting it and then restricting the linguistic record. A failure can reveal an inadequate restriction, a mistaken realization, or a record that cannot be interpreted without further context. It does not by itself show that the underlying linguistic practice is contradictory.

An indexed family $(f_R)_R$ is compatible when each specified restriction sends f_R to f_S . If two regions overlap, their restrictions to the overlap must agree under the selected comparison. Such agreement does not automatically supply a global datum, much less a unique one. A gluing principle is additional structure. The field formalism already makes its realizability result conditional on the existence of suitable compatible preimages and its uniqueness result conditional on the relevant uniqueness assumptions [11, pp. 29–31]. For linguistic inquiry this qualification matters: separately adequate local descriptions need not have a common interpretation simply because their recorded vocabularies overlap.

The local-data direction in Equation 8 runs from larger regions to smaller ones. The inclusion of observables with small support into an algebra for a larger region runs in the opposite direction. Section 7 develops this second construction. Confusing the two directions would conceal a substantive distinction between reducing a configuration and making more observations available.

6.2 Interface-Dependent Dynamics

Static compatibility describes which local records can belong to one represented configuration. Dynamic compatibility concerns how these records change. The two requirements should remain separate. A collection of local fields may fit together at one stage while proposed updates disagree at a shared interface.

For a selected operation a , let $N_a(R)$ be an admitted dependency neighborhood containing R . It includes the information required to determine the next record over R . Assume $N_a(S) \subseteq N_a(R)$ whenever $S \subseteq R$. In a fixed-carrier regime, a neighborhood-dependent local law has the type in Equation 10.

$$D_R^a : \mathcal{F}(N_a(R)) \rightarrow \mathcal{F}(R). \quad (10)$$

Equation 10 does not assume that the future regional datum is determined by the present datum on R alone. For example, the uptake of a correction can depend on an interface linking an activity inside the

selected region to an interlocutor outside it. The needed input may concern their relation, rather than an additional property of either isolated participant.

For nested regions, the local laws are dynamically compatible when the diagram expressed by Equation 11 commutes on its stipulated admissible domains.

$$\rho_{RS} \circ D_R^a = D_S^a \circ \rho_{N_a(R)N_a(S)} \quad (S \subseteq R). \quad (11)$$

Equation 11 compares two ways of calculating the next datum on S : first update the larger neighborhood and restrict its output, or first restrict the input to the smaller required neighborhood and update there. Both routes still retain the external inputs required by S . Covariance therefore supplies consistency without silently assuming regional autonomy.

Proposition 6.1 (Compatibility Of Neighborhood Updates). *Suppose an indexed input family is compatible on the neighborhoods $N_a(R)$, all required updates are defined, and Equation 11 holds. Then the family of outputs $g_R = D_R^a(f_{N_a(R)})$ is compatible under the specified regional restrictions. If that output family admits gluing in the selected field structure, it determines an admissible global output; uniqueness requires unique gluing.*

Proof. For $S \subseteq R$, covariance gives

$$\rho_{RS}(g_R) = D_S^a(\rho_{N_a(R)N_a(S)}f_{N_a(R)}) = D_S^a(f_{N_a(S)}) = g_S. \quad (12)$$

The middle equality in Equation 12 uses input compatibility. This proves the output compatibility claim. The remaining conclusions apply the separately assumed gluing and uniqueness properties; neither follows from covariance alone. $\square$

Proposition 6.1 is a conditional construction, not an existence theorem for globally executable linguistic histories. It assumes that the relevant operations can be applied to the supplied inputs. Resource constraints, permissions, participant capacities, and admissibility changes can prevent that assumption from holding. Moreover, one compatible step supplies a multi-step trajectory only when each later input remains in the domain of the next step. The inherited formalism distinguishes those execution conditions from the composition of already defined maps [11, pp. 34–39].

6.3 A Constructed Interface Field

A restricted model now isolates the boundary issue without assigning a numerical amount to a language. Let G be a directed graph without self-loops, finite or locally finite. Its vertices index selected interaction positions; its edges index possible directed uptake interfaces. A vertex is not necessarily a person: it can represent a recurring activity at which a declared response distinction is observed. For each vertex v , let $x_v \in \{0, 1\}$ record which of two specified response alternatives occurs in that activity. For each edge e , let $c_e \in \{0, 1\}$ record whether the stipulated uptake connection is enabled. These bits have local operational meanings. They measure neither total competence nor linguistic worth.

For a subgraph region R , write V_R and E_R for its vertices and edges. The field carrier and its restrictions are given in Equation 13.

$$\mathcal{F}_G(R) = \{0, 1\}^{V_R} \times \{0, 1\}^{E_R}, \quad \rho_{RS} = \text{coordinate restriction to } (V_S, E_S). \quad (13)$$

Equation 13 supplies total restrictions and exact gluing for compatible assignments on a covering family: each covered coordinate receives its common value. This property belongs to the product construction and is not being asserted for every regional linguistic model. A realization Ξ_R assigns each coordinate its declared response or interface interpretation. The interpretation is stipulated for this example; applying it to actual linguistic activity would require independent operational and empirical work.

Choose an edge $e : s \rightarrow t$. A local response operation U_e leaves every coordinate unchanged except x_t , as stated in Equation 14.

$$x'_t = x_t \oplus (c_e x_s), \quad x'_v = x_v \ (v \neq t), \quad c'_f = c_f \text{ for every edge } f. \quad (14)$$

Full Input	Current Profile q	Full Output U	Next Profile qU
(1, 0, 0)	(1, 0)	(1, 0, 0)	(1, 0)
(1, 0, 1)	(1, 0)	(1, 1, 1)	(1, 1)

Table 2: Two constructed configurations with the same retained response profile. The enabled interface changes the next response while the current profile remains identical.

Here $\oplus$ denotes addition modulo two and $c_e x_s$ is Boolean conjunction. Equation 14 says that the selected target response changes precisely when the source response and the enabled interface jointly activate the stipulated revision. It is an exact constructed law, not an empirical theory of learning or correction. Its purpose is to exhibit an interaction that cannot be inferred from the target response alone. The law depends jointly on two input indicators; replacing it with a sum of independent vertex effects would remove the dependency being studied.

The law defines a total update on the full product carrier $\Omega_G = \mathcal{F}_G(G)$. For a regional output, take $N_e(R) = R$ when $t \notin V_R$. When $t \in V_R$, adjoin the edge e and its endpoints to R . This neighborhood assignment is monotone. Define D_R^e by applying Equation 14 to the required input coordinates and retaining the coordinates of R . For $S \subseteq R$, every unchanged output coordinate is the same input coordinate on both sides of Equation 11; if $t \in V_S$, both sides use exactly x_t, c_e, x_s . The covariance equation therefore holds for every pair of admitted subgraphs. The construction provides a consistent regional dynamic law on arbitrarily many interaction positions, although the counterexample below needs only one edge.

The dependence is nonlinear when the Boolean response coordinates are embedded in a real coordinate space. On their declared Boolean domain, Equation 15 is an equivalent polynomial expression.

$$x'_t = x_t + c_e x_s - 2x_t c_e x_s. \quad (15)$$

Equation 15 identifies the interaction terms; it does not extend the linguistic meaning of a binary response indicator to arbitrary real values. No differentiable field equation or continuous scale of linguistic reality is inferred. The field construction earns its role through distributed dependencies, regional restriction, and a coherent interaction law, rather than through the presence of a continuous variable.

6.4 A Regional Autonomy Obstruction

Restrict attention to one edge and abbreviate its full input as $(x, y, c) = (x_s, x_t, c_e)$. Suppose the retained profile records the two responses while omitting their uptake interface. The profile map and operation are stated together in Equation 16.

$$q(x, y, c) = (x, y), \quad U(x, y, c) = (x, y \oplus (cx), c). \quad (16)$$

The pair of full configurations in Equation 16 need not represent separate languages. They represent two possibilities left open by the same selected record. Table 2 compares possibilities whose current response profiles agree.

Proposition 6.2 (Omitted Interface Obstruction). *For the maps in Equation 16, there is no function $u : \{0, 1\}^2 \rightarrow \{0, 1\}^2$ satisfying $u \circ q = q \circ U$ on all eight full configurations.*

Proof. The two inputs in Table 2 have the same image (1, 0) under q . Their images under $q \circ U$ differ. A function u would therefore have to send (1, 0) to two different outputs, which is impossible. $\square$

Proposition 6.2 establishes a failure of the selected autonomous update, not a failure of regional reality. Three responses are available. The inquiry can retain c in an enlarged record. It can keep q and supply c as an external input, obtaining the defined input-dependent law $u_c(x, y) = (x, y \oplus cx)$. Or it can use q only for the current classification that it actually supports. Selecting among these responses

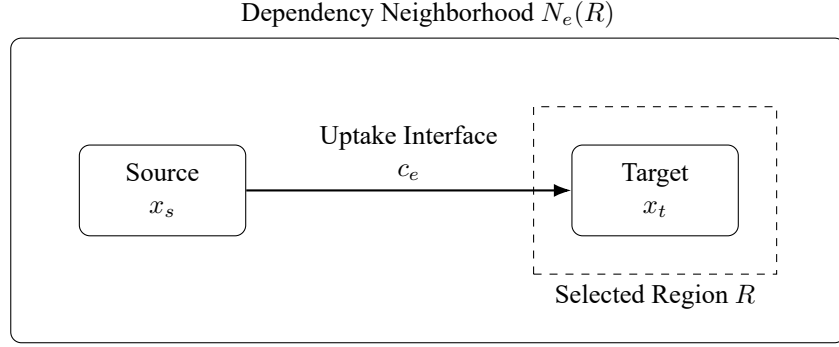


Figure 4: A selected target region and the larger neighborhood required by the constructed update. The boundary marks a choice of description. The arrow represents the stipulated uptake dependency, not a historical lineage or a normative entitlement.

depends on the explanatory question and evidence. The construction does not establish that all interacting regions must be classified as one language.

The same distinction applies to the proposed linguistic interpretation. Two activities may display the same elicited responses while differing in whether correction passes between them. If an inquiry seeks only to classify those responses, the profile can be adequate. If it attributes the next pattern of coordinated revision to a closed regional organization, the omitted interface matters. Such an empirical claim would require evidence that the tested interface has the relevant role. The model shows how that role could defeat a boundary assumption; it supplies neither the evidence nor a universal criterion of language identity.

Figure 4 distinguishes the target region from its dependency neighborhood. It also indicates why a formally well-defined small region need not support a closed law.

6.5 Historical Carrier Extensions

The fixed graph and its current response coordinates are one sector of a historically extended representation. They should not replace the history-bearing carrier introduced in Section 5. A direct construction retains the sequence of operations and the configurations through which they pass. For a finite graph and a sequence of n executed updates, use a copy G_j for each stage $j = 0, \dots, n$. Vertical edges connect corresponding vertices at successive stages. For each graph edge, the product with a stage interval supplies a rectangular face recording that interface across the two stages. The resulting product cell structure and its labels are specified in Equation 17.

$$K_n = G \times [0, n], \quad \lambda_n|_{G_j} = \omega_j, \quad \omega_{j+1} = U_{e_j}(\omega_j). \quad (17)$$

The interval in Equation 17 has integer vertices and unit edges, so the product is a two-complex. Operation labels on successive layers retain which e_j was executed. The stage coordinate orders this constructed trace; it is not proposed as a fundamental time coordinate for all linguistic processes. The same construction can be restricted to finite patches of a locally finite graph. It represents both interaction incidence and ordered development, rather than merely a final state.

Appending a stage gives an embedding $K_n \hookrightarrow K_{n+1}$ that leaves all recorded old labels unchanged. The current response at the new layer may differ from the response on the preceding layer. Historical retention therefore does not require the currently observed response to remain invariant. This elementary distinction is essential when an individuation claim follows a practice that changes through correction or transmission.

The product construction also makes its limitation visible: it retains one graph of interaction positions throughout the trace. A new participant role, a different institution, or a newly available interface can require a successor carrier with new cells. At a retained anchor K_n , one can attach either of two

admissible future complexes K_1^+ and K_2^+ , with embeddings ι_1 and ι_2 that preserve the declared old record. One successor may add a new uptake interface and the other may continue without it. The future operation families then need not share one fixed domain. This is an application of the already established anchored-extension architecture and optional operation-descendant correspondences [11, pp. 46–57].

Two distinctions must be preserved. First, different newly attached interfaces can produce different futures while the selected old anchor remains the same; they do not thereby alter the recorded occurrence of an old event. Second, an inquiry can revise its representation of that event or its significance. Such revision requires an explicit comparison between representations and should not be disguised as merely adding a future layer. A field model must state which of these operations it performs.

Neither the product trace nor the more general attachments establish that a successor constitutes the same language as its predecessor. They provide a history-bearing object on which that question can be formulated with the witness modes, retained profiles, and evidence already distinguished. The analytical result of the field investigation is narrower and useful: a chosen profile or regional boundary may hide an interaction needed for its proposed dynamic explanation, while a richer historical representation can retain both the changing responses and the relations through which they change. The operator construction that follows identifies the corresponding failure directly in the observables and execution domains of the model.

7 Linguistic Operation Algebras

The field construction identifies an omitted relation that changes the future of a retained response profile. An operator account can express the same problem as a failure of closure: an operation requires distinctions that the selected record does not retain. This section derives that connection from partial configuration maps and explicitly defined observables. It then develops a positive response through continuation refinement, calculates the required distinctions in a gated interface chain, and compares an autonomous profile with an input-dependent boundary description. Regional observables and historical records supply the final connections to the field and history constructions. The partial-quotient criterion, continuation refinement and distinction between predictive and historical sufficiency are inherited from the GR metamodel [10, pp. 22–25, 75–79]. Their developed application here concerns the explanatory responsibilities of a linguistic boundary profile; the generic quotient and finite-stabilization results are not new claims.

7.1 Partial Profile Dynamics

Let Ω and Ω' be nonempty carriers of configurations in a specified model. They can contain current field data, history-bearing configurations, or differently represented source and successor histories. An operation has the type in Equation 18.

$$U : D_U \subseteq \Omega \longrightarrow \Omega'. \quad (18)$$

The domain D_U in Equation 18 records the represented applicability of this operation. What makes it applicable must be stated separately. Mathematical definedness, procedural permission, practical capacity, and warranted authority are not interchangeable. A domain can represent one or a declared combination of them, but its membership predicate does not establish the remaining conditions. In particular, a path in a graph of represented operations does not by itself give a participant the means or entitlement to execute it.

A sequence of partial operations is executable from a starting configuration only when every intermediate output lies in the domain of the next operation. Its composite is useful for endpoint comparison, but a composite map alone need not retain the sequence, intermediate configurations, or historical reasons for its execution. The history construction in Section 6.5 retains those data explicitly. This distinction prevents two traces with the same endpoint map from being assigned one history merely because their final effects agree.

Choose surjective profile maps $q : \Omega \rightarrow X$ and $q' : \Omega' \rightarrow X'$. For the boundary application, these maps are obtained from the criterion and record construction in Equation 4, on their admitted configuration sectors. The general result also applies to other explicitly interpreted profiles. Restricting a profile codomain to its image makes the map surjective; this step does not extend the extractor to configurations for which its interpretation is unavailable. The source and target profiles need not have the same carrier. An induced partial operation u would make the retained dynamics satisfy Equation 19.

$$u : q(D_U) \longrightarrow X', \quad u \circ q = q' \circ U \text{ on } D_U, \quad D_U = q^{-1}(q(D_U)). \quad (19)$$

The final condition in Equation 19 requires the profile to reflect applicability: configurations with the same retained profile cannot disagree about whether U is defined. Omitting this condition gives a weaker projected effect on some representatives, but permits the profile to hide an execution failure for others.

Proposition 7.1 (Exact Partial Profile Descent). *An induced map satisfying Equation 19 exists if and only if D_U is a union of q -fibers and $q'U(\omega) = q'U(\tilde{\omega})$ whenever $\omega, \tilde{\omega} \in D_U$ satisfy $q(\omega) = q(\tilde{\omega})$. When it exists, the induced map is unique on $q(D_U)$.*

Proof. If an induced map exists, the last equality in Equation 19 gives the domain condition. If two applicable configurations have the same profile, applying the function u to that profile gives the same target profile, proving output constancy. Conversely, assume both conditions. For $x \in q(D_U)$, choose any $\omega \in D_U$ with $q(\omega) = x$, and define $u(x) = q'U(\omega)$. Output constancy makes the choice independent of the representative. The domain condition gives applicability reflection. Every value is fixed by some representative, which proves uniqueness. $\square$

Proposition 7.1 is the source/target-profile form of the inherited domain-saturation criterion [10, p. 79]. Its two conditions diagnose different deficiencies. The interface example of Proposition 6.2 violates output constancy even though its operation is total. A second operation can violate domain saturation while having a trivial effect. On the same Boolean carrier, define V by Equation 20.

$$D_V = \{(x, y, c) : c = 1\}, \quad V(x, y, c) = (x, y, c) \text{ for } (x, y, c) \in D_V. \quad (20)$$

For the retained profile $q(x, y, c) = (x, y)$, every profile has both an applicable and an inapplicable representative. Equation 20 therefore has no applicability-reflecting partial descent, despite leaving all applicable profiles unchanged. If c is interpreted as a required uptake connection, a response-only record can hide the loss of access to the represented operation. Whether that connection reflects technical provision, social access, or another condition must remain explicit; the example does not collapse these interpretations.

The availability and effect conditions also delimit a permissible inference about language individuation. Failure of descent shows that a chosen profile cannot carry the specified autonomous operation with the stated fidelity. It does not show that no adequate profile exists, that the region lacks linguistic reality, or that speakers should receive a different official classification. An inquiry can change its retained distinctions, provide external inputs, or narrow the operation claim.

7.2 Partial Observable Pullbacks

An algebraic representation requires an actual algebra, not merely a collection called operators. A simple classical construction suffices here. For a nonempty set Ω , let $\mathcal{A}(\Omega)$ be the bounded complex-valued functions on Ω , with the operations stated in Equation 21.

$$\mathcal{A}(\Omega) = \ell^\infty(\Omega; \mathbb{C}), \quad (fg)(\omega) = f(\omega)g(\omega), \quad f^*(\omega) = \overline{f(\omega)}, \quad \|f\|_\infty = \sup_{\omega \in \Omega} |f(\omega)|. \quad (21)$$

Addition and scalar multiplication in Equation 21 are pointwise. This is a commutative unital C^* -algebra: bounded functions are complete in the supremum norm and $\|f^*f\|_\infty = \|f\|_\infty^2$. Its elements are mathematical observables, not an assertion that every bounded function is empirically measurable or practically

accessible. Functions of the selected linguistic profile will form a smaller mathematical subalgebra. Actually elicitable observations need not exhaust that subalgebra or be jointly obtainable without changing the practice. The complex scalars support this familiar representation without making the configurations quantum states or implying that linguistic reality is fundamentally linear.

For the partial operation U of Equation 18, define its pullback by composition on the execution domain and zero outside it, as in Equation 22.

$$\alpha_U : \mathcal{A}(\Omega') \longrightarrow \mathcal{A}(\Omega), \quad (\alpha_U f)(\omega) = \begin{cases} f(U\omega), & \omega \in D_U, \\ 0, & \omega \notin D_U. \end{cases} \quad (22)$$

Equation 22 is a specified representation of partiality. Zero outside the domain records the convention used to extend the function; it is not a physical output or an empirical failure score. Applicability remains recoverable from the image of the constant function 1.

Proposition 7.2 (Partial Pullback Structure). *The pullback α_U preserves products and the involution. It is complex-linear and contractive. It satisfies $\alpha_U(1) = \mathbf{1}_{D_U}$, so it is unital exactly when U is total. If $V : D_V \subseteq \Omega' \rightarrow \Omega''$ is another partial operation, then Equation 23 holds.*

$$\alpha_{V \circ U} = \alpha_U \circ \alpha_V, \quad D_{V \circ U} = \{\omega \in D_U : U\omega \in D_V\}. \quad (23)$$

Proof. At a point of D_U , composition preserves sums, scalar multiplication, products, and complex conjugation. At a point outside D_U , both sides of each identity vanish; products vanish because both pulled-back factors vanish there. The supremum of $|f \circ U|$ on D_U is at most $\|f\|_\infty$, proving contractivity. Substituting the constant function 1 gives the domain indicator. For composition, if $\omega \in D_U$ and $U\omega \in D_V$, both sides of Equation 23 equal $f(V(U\omega))$. In either remaining case both sides vanish. These cases exhaust the source carrier. $\square$

Proposition 7.2 makes two distinctions useful for the inquiry. First, the algebra map reverses the configuration map's direction: a target observable becomes a source observable by asking what its value will be after the operation. Second, the image of the unit retains applicability even when all observed effects happen to be unchanged. A formalism using only output values and silently treating every map as unital would lose the domain issue exposed by Equation 20.

The proposition does not identify this commutative function algebra with the full range of GR operator structures. The existing field formalism permits other map classes and specifies extra conditions for positive, completely positive, or representation-dependent constructions [11, pp. 40–45]. Those structures are unnecessary for this countermodel. Introducing quantum or noncommutative language would require an independent modeling argument.

7.3 Profile Algebra Stability

A surjective profile map $q : \Omega \rightarrow X$ embeds profile observables into full observables. Equation 24 defines the resulting subalgebra.

$$q^* : \ell^\infty(X; \mathbb{C}) \hookrightarrow \mathcal{A}(\Omega), \quad q^* f = f \circ q, \quad \mathcal{A}_q = q^* \ell^\infty(X; \mathbb{C}). \quad (24)$$

The elements of $\mathcal{A}_q$ in Equation 24 are exactly the bounded functions constant on each q -fiber. Surjectivity makes q^* injective and isometric. This subalgebra formalizes the distinctions retained by the selected profile without treating that profile as the whole formation.

Proposition 7.3 (Observable Criterion For Partial Descent). *With the surjective source and target profiles of Proposition 7.1, the following inclusion holds if and only if an applicability-reflecting induced partial operation exists:*

$$\alpha_U(\mathcal{A}_{q'}) \subseteq \mathcal{A}_q. \quad (25)$$

Proof. If an induced operation u exists, pulling back a target profile function f gives $f(u(q(\omega)))$ when $q(\omega) \in q(D_U)$ and zero otherwise. Domain saturation makes this expression a function of $q(\omega)$ alone. It is bounded, so it belongs to $\mathcal{A}_q$.

Conversely, assume Equation 25. Applying it to the constant target function shows that $\mathbf{1}_{D_U}$ is constant on every q -fiber. The domain is therefore saturated. If two applicable configurations with the same source profile had different target profiles, a bounded indicator function on X' could distinguish those two profiles. Its pullback would differ on that source fiber, contradicting the assumed inclusion. Output constancy follows, and Proposition 7.1 gives the induced operation. $\square$

Proposition 7.3 supplies an observable formulation of the inherited quotient condition. Its use here is diagnostic. The selected record is adequate for the specified autonomous operation exactly when every retained target observable pulls back to a distinction already represented in the source record, including the applicability distinction. The result assumes the full bounded-function algebras of the selected profiles; a smaller empirical repertoire may fail to separate different target profiles. Passing a finite set of probes would then provide weaker evidence. Algebraic closure under products does not certify joint practical access to the corresponding observations. When elicitation changes the history, the observation procedure and its effects require the separate account developed in Section 9.

In the total Boolean update of Equation 16, let $p_y(x, y, c) = y$ denote the target-response observable. This belongs to the response-profile algebra, whereas its pullback in Equation 26 does not.

$$\alpha_U(p_y)(x, y, c) = y \oplus (cx) = y + cx - 2ycx. \quad (26)$$

The two states in Table 2 give different values in Equation 26 despite sharing the same retained profile. The failure is therefore visible directly in the observable algebra. The operation is nonlinear on its response coordinates while its pullback remains linear as a map on functions. These statements concern different carriers and are fully compatible. Linearity of observable transport supplies no argument for linear linguistic dynamics.

For the domain-restricted identity in Equation 20, the obstruction is even simpler: $\alpha_V(1) = c$ is absent from the response-profile algebra. The discarded distinction affects whether the operation can occur, although it never changes an applicable configuration. A comparison that tests effects alone can consequently overlook a changed operational relation.

These two cases distinguish static profile agreement, operational sufficiency, and historical explanation. Adding enough observables to obtain closure for a declared operation family can improve a predictive model. It does not establish a historical witness, recover discarded provenance, or determine who may choose the operations and observations. The inherited metamodel expressly separates continuation-sensitive predictive quotients from explanatory history [10, pp. 22–31, 75–79]. The present algebraic test preserves that separation.

7.4 Continuation-Refined Boundary Profiles

A failed descent identifies an omitted distinction but does not yet determine how much additional information the chosen task needs. Retaining the full configuration always supplies one response within a fixed deterministic model. A smaller refinement can preserve exactly the selected observation and its declared continuation responsibilities. The following construction specializes the metamodel's continuation signatures and finite refinement to partial linguistic operations [10, Sections 6.2–6.7, pp. 23–25]. Giving its derivation here makes the later boundary comparison assessable without treating its elementary mathematics as a new individuation theory.

Fix a nonempty finite carrier Ω , a finite operation alphabet B , partial maps $U_b : D_b \subseteq \Omega \rightarrow \Omega$ for $b \in B$, and an initial profile $q : \Omega \rightarrow X = q(\Omega)$. The same carrier and profile interpretation are retained throughout this construction. In the application, q is the criterion-derived profile of Equation 4. The alphabet names the operations whose effects and applicability the description claims to carry. It need not contain every operation available to participants, and two labels can denote the same map. An added operation or a changed domain requires a new check.

To retain partiality in a word outcome, adjoin a fresh state $\dagger$ and a fresh profile value $\perp$. Neither belongs to the original carrier or profile range. Equation 27 gives the declared execution convention.

$$\widehat{\Omega} = \Omega \sqcup \{\dagger\}, \quad \widehat{U}_b(\omega) = \begin{cases} U_b(\omega), & \omega \in D_b, \\ \dagger, & \omega \in \widehat{\Omega} \setminus D_b, \end{cases} \quad \widehat{q}|_{\Omega} = q, \quad \widehat{q}(\dagger) = \perp. \quad (27)$$

The absorbing state in Equation 27 records that the declared word cannot be completed after an inapplicable step. It does not represent a physically irreversible failure, a loss of the whole practice, or an unattempted operation. A repair after a failed attempt would require a different execution model. Likewise, missing evidence for β or e_κ is not assigned this marker: the admitted carrier was fixed before the operation model was defined.

Words execute from left to right. For the empty word ϵ , set $\widehat{U}_\epsilon = \text{id}_{\widehat{\Omega}}$; for a letter b followed by a word w , set $\widehat{U}_{bw} = \widehat{U}_w \circ \widehat{U}_b$. These are free words. Any proposed equations between words must be verified after domains are introduced. With this convention, Equation 28 defines an equivalence E_n on the original carrier for each integer $n \geq 0$.

$$\omega E_n \widetilde{\omega} \iff \widehat{q}(\widehat{U}_w \omega) = \widehat{q}(\widehat{U}_w \widetilde{\omega}) \quad \text{for every } w \in B^* \text{ with } |w| \leq n. \quad (28)$$

Equation 28 compares all modeled tests within a horizon, including the empty word. It therefore retains the starting profile. Because every prefix is itself among the tests, a difference in the earliest blocking step is detected even if a longer word eventually blocks from both states. Equal outcomes do not preserve the cause of blockage unless that cause is added to the selected observation.

The recursion in Equation 29 makes this definition calculable without enumerating every longer word afresh.

$$\begin{aligned} \omega E_{n+1} \widetilde{\omega} &\iff q(\omega) = q(\widetilde{\omega}) \quad \text{and, for every } b \in B, \\ &\omega \in D_b \iff \widetilde{\omega} \in D_b, \\ &\omega, \widetilde{\omega} \in D_b \implies U_b \omega E_n U_b \widetilde{\omega}. \end{aligned} \quad (29)$$

To derive Equation 29, separate the empty word from words beginning with b . The empty word yields the first condition. If only one state admits b , the one-letter outcomes differ because $\perp$ is outside X . If both states block, every longer word with that first letter blocks from both. If both admit b , their remaining suffixes have length at most n , so agreement is exactly E_n of the successors. These cases cover every word in the required horizon.

7.5 Finite Refinement Certificates

The recursion supplies both a positive model construction and a limit on its claim. A stable refinement determines a sufficient profile for the declared operation family. A bounded refinement before stabilization need not support even one further update of its own classes. The distinction matters when a linguistic boundary is defended by a limited set of successful interactions.

Proposition 7.4 (Finite Partial Continuation Refinement). *Let $N = |\Omega|$ and let $r_0 = |q(\Omega)|$. The relations E_n are equivalences and decrease under inclusion. Some $n_* \leq N - r_0$ attains a stable value $E_* = E_{n_*}$, and equality $E_{n_*+1} = E_{n_*}$ certifies that every later relation is equal to it. The relation E_* is the greatest equivalence contained in $\ker q$ for which every D_b is saturated and every U_b preserves equivalence on its domain. Consequently the quotient supports the initial profile and applicability-reflecting partial updates.*

Proof. For each n , Equation 28 is equality of finite outcome signatures, hence is reflexive, symmetric and transitive. Increasing the horizon retains all earlier words, so $E_{n+1} \subseteq E_n$. At horizon zero the signature consists of q , giving r_0 classes.

Every strict refinement splits at least one class and increases the class count by at least one. There can be at most $N - r_0$ strict increases. If two consecutive relations agree, Equation 29 applies the same

rule to the same relation at the next step; induction makes every subsequent relation equal. Thus a stable relation is attained at a depth no greater than $N - r_0$. One further comparison can be needed to certify that the attained value is stable.

The stable relation equals the intersection of all the E_n . It therefore compares the outcomes of every finite word. At a fixed point of Equation 29, related states have equal current profiles, equal definedness for each letter, and related successors whenever that letter applies. Thus E_* has the asserted compatibility properties.

Let E be any other equivalence with those properties and contained in $\ker q$. Starting from two E -related states, each next operation either blocks from both or applies to both and leaves related successors. Induction on word length therefore gives equal outcomes for every word, including words with a blocked prefix. Hence $E \subseteq E_n$ for every n , and $E \subseteq E_*$. This proves maximality under inclusion, or coarseness among partitions satisfying the selected responsibilities.

Finally define the quotient profile by $[\omega]_{E_*} \mapsto q(\omega)$ and define the b update on classes meeting D_b by $[\omega]_{E_*} \mapsto [U_b \omega]_{E_*}$. Containment in $\ker q$ makes the profile independent of its representative. Domain saturation makes the update domain a union of whole classes; successor compatibility makes its value independent of the representative. These are exactly the conditions of Proposition 7.1. $\square$

Proposition 7.4 restates the inherited finite construction with its partial-domain responsibilities exposed. It supplies a least additional discrimination requirement for the fixed task, rather than a uniquely justified boundary for a language. Writing $q_*(\omega) = [\omega]_{E_*}$, there is a well-defined map from its quotient carrier to X that recovers q . The refinement thus retains the original criterion-derived observation. It adds precisely the distinctions required to make that observation's declared continuation dynamics autonomous in this model.

There is a parallel algebraic conclusion. For each b , $\alpha_{U_b}(\mathcal{A}_{q_*}) \subseteq \mathcal{A}_{q_*}$ by Proposition 7.3, and $\mathcal{A}_q \subseteq \mathcal{A}_{q_*}$. Here a profile algebra is the unital $*$ -subalgebra of the finite configuration function algebra consisting of all functions constant on the blocks of its profile partition. Any such algebra containing $\mathcal{A}_q$ and stable under every α_{U_b} arises from a compatible refinement, so it contains $\mathcal{A}_{q_*}$. The indicator functions of the partition blocks span the profile algebra, while closure under the pullbacks supplies domain saturation and successor compatibility by Proposition 7.3. Thus the partition and observable descriptions impose the same selected responsibilities. This statement uses full complex function algebras on the finite profiles, not an arbitrary empirical collection of probes.

The finite bound concerns a specified carrier and complete transition table. It does not turn a finite collection of observations into evidence that all unobserved social transitions obey that table. Nor does a refinement reconstruct missing information from the original profile alone. If two configurations have the same q but different q_* , the coarse record cannot determine which refined value is correct. Additional evidence or retained configuration data are necessary [10, Section 17.2, p. 79].

7.6 Gated Interface Histories

A chain makes three consequences concrete: short probes can miss a dependency, an adequate refinement can retain coupled quantities rather than every coordinate, and applicability can require a distinction that outcome change alone would omit. This is a stipulated extension of the Boolean interface model. Each response bit represents one declared alternative at an interaction position. Each gate states whether the corresponding interface transmits that modeled alteration. A toggle is an illustrative change between alternatives, not a measure of competence, agreement or linguistic value. No empirical claim that actual correction follows a Boolean rule is made.

Take $m \geq 1$ successive interfaces, with response coordinates $x_0, \dots, x_m$ and fixed gate coordinates $c_1, \dots, c_m$. The carrier, initial target profile and edge operations are stated in Equation 30.

$$\begin{aligned} \Omega_m &= \{0, 1\}^{m+1} \times \{0, 1\}^m, & q(\omega) &= x_m, \\ U_i : x_i &\mapsto x_i \oplus (c_i x_{i-1}) \quad (1 \leq i \leq m), & \text{all other coordinates unchanged.} \end{aligned} \tag{30}$$

The updates in Equation 30 are total. Add a partial operation V that leaves the configuration unchanged and has domain $D_V = \{\omega : c_m = 1\}$. It represents a separately declared use of the target interface that requires the gate. It does not assert that toggling and this further use have identical availability conditions. The alphabet $B = \{a_1, \dots, a_m, v\}$ assigns U_i to a_i and V to v . The gate may model a technical connection or another specified support; its formal role alone does not decide social entitlement to use it.

The response-only profile hides the support architecture, but retaining all $2m + 1$ coordinates is unnecessary for this task. Define the coupled coordinates in Equation 31.

$$\begin{aligned} g &= c_m, & z_0 &= x_m, \\ z_j &= \left(\prod_{k=m-j+1}^m c_k \right) x_{m-j} \quad (1 \leq j \leq m), \\ p_*(\omega) &= (z_0, g, z_1, \dots, z_m). \end{aligned} \tag{31}$$

In Equation 31, an upstream alternative matters only through the interface gates connecting it to the target. These products represent that declared dependence; they are not scalar scores assigned to a capacity or a social relation. The separate coordinate g is retained because V tests applicability even when every transmitted response is zero. This illustrates the taxonomy's distinction between component records and their joint generative realization [12, Sections 7–8].

Proposition 7.5 (Sufficient Coupled Chain Profile). *For the declared chain operations and target profile, $\ker p_* = E_*$. The stable quotient has $2 + 2^{m+1}$ classes. It is attained at horizon m , and for every $n < m$ there are two states that agree under all words of length at most n but are distinguished by a longer admitted word.*

Proof. First calculate the effect of U_i on the profile coordinates. Only x_i changes. For $i = m$, this changes z_0 by z_1 . For $i < m$, the affected coupled coordinate is z_{m-i} . Multiplication by its trailing gates converts the changed term $c_i x_{i-1}$ into z_{m-i+1} . Boolean multiplication distributes over exclusive-or, and repeated gates satisfy $c_k^2 = c_k$. Thus the common update rule is Equation 32.

$$U_i : z_{m-i} \mapsto z_{m-i} \oplus z_{m-i+1}, \quad g \text{ and every other } z_j \text{ unchanged.} \tag{32}$$

The domain of V is $g = 1$, and its effect is identity. Equation 32 therefore proves that $\ker p_*$ is an applicability-reflecting compatible refinement of $\ker q$. By Proposition 7.4, it is contained in E_* .

For the reverse containment, define $w_0 = \epsilon$ and $w_j = a_{m-j+1} \cdots a_m$ for $1 \leq j \leq m$, and write U_{w_j} for the ordinary left-to-right composite of these total edge operations. Successive application of Equation 32 gives Equation 33.

$$\begin{aligned} q(U_{w_j}\omega) &= z_0 \oplus z_1 \oplus \cdots \oplus z_j, \\ z_j &= q(U_{w_j}\omega) \oplus q(U_{w_{j-1}}\omega) \quad (j \geq 1). \end{aligned} \tag{33}$$

Every word used in Equation 33 is total and has length at most m . These observations recover $z_0, \dots, z_m$. The one-letter word v recovers g from success or blockage because its ordinary outcome lies in $\{0, 1\}$ and its blocked outcome is $\perp$. Hence equality of all horizon- m outcomes implies equality of p_* . Together with compatibility this proves $E_m = \ker p_* = E_*$.

When $g = 0$, all z_j with $j \geq 1$ vanish and the two values of z_0 give two profiles. When $g = 1$, every binary assignment to $z_0, \dots, z_m$ is realizable by setting all gates to one and choosing the response coordinates accordingly. This gives 2^{m+1} further profiles, establishing the count.

Finally choose all gates equal to one, all responses except x_0 equal to zero, and compare the two values of x_0 . Their only initial difference lies at position zero. A coordinate update can move its possible influence at most one edge along the chain, and V moves none. A word shorter than m cannot make the target responses differ; its domain outcomes also agree because all gates remain one. The word $a_1 \cdots a_m$ does make the target responses differ by Equation 33. Thus every horizon below m can miss a relevant continuation distinction. $\square$

Table 3: Three-Interface Profile Refinement

Horizon	Equivalent Profile Coordinates	Class Count
0	z_0	2
1	(z_0, g, z_1)	6
2	(z_0, g, z_1, z_2)	10
3	(z_0, g, z_1, z_2, z_3)	18
4	The same stable profile; consecutive equality certified	18

For three interfaces, Proposition 7.5 gives 18 stable profile classes from 128 configurations. Table 3 records the actual successive refinements. The horizon-one profile must already retain the last gate and the first transmitted quantity; longer horizons introduce upstream coupled quantities. At the stable stage, the original target response is still recovered as z_0 .

The entries in Table 3 follow from the same one-edge dependency calculation used in the proof: each additional horizon can expose one further z_j , while v exposes g from horizon one. They are also independently checked by direct enumeration of every word through the displayed horizon on all 128 configurations. The comparison concerns hypothetical model operations, not a claim that speakers can ethically or practically be subjected to every such probe.

The refinement can merge different support configurations. If an upstream gate is closed, some earlier alternatives have no effect on the selected target under this repertoire. Those distinctions need not enter p_* . They can nevertheless matter to another operation, to the formation’s historical constitution, or to the explanation of why that gate is closed. A sufficient operational profile remains a projection of a richer history-bearing description. It cannot license erasing the corresponding historical records.

7.7 Open Boundary Inputs

The refined quotient provides an autonomous description for the declared task. It is not the only coherent response to the original failure of descent. A regional account can retain the target response internally and supply the relevant interface as an input. This alternative distinguishes a boundary of the selected linguistic formation from a boundary of autonomous prediction. Dependence across the first boundary does not logically require merging the formations on either side.

For the same chain, let $I = \{0, 1\}^2$ and define the interface record $r(\omega) = (x_{m-1}, c_m)$. Write an input as $(a, c) \in I$ and an internal response as $y \in \{0, 1\}$. The input-dependent maps are given in Equation 34.

$$\begin{aligned}
u_{a_i}(y, a, c) &= y & (i < m), \\
u_{a_m}(y, a, c) &= y \oplus ca, \\
u_v(y, a, c) &= y & \text{with domain } c = 1.
\end{aligned} \tag{34}$$

The first two lines of Equation 34 are total on $\{0, 1\} \times I$; the last line is partial. The letter labels remain those of the original operation family. An upstream update has no immediate effect on the internal target but can alter the input supplied at a later step. For every letter $b \in B$, Equation 35 records exact domain and outcome agreement.

$$\begin{aligned}
\omega \in D_b &\iff (q(\omega), r(\omega)) \in \text{Dom}(u_b), \\
q(U_b\omega) &= u_b(q(\omega), r(\omega)) \quad (\omega \in D_b).
\end{aligned} \tag{35}$$

Equation 35 follows directly from the target update and the domain $c_m = 1$ of V . Applying it successively reproduces a word’s target outcomes when each applicable step receives the fresh interface record of that step’s configuration. The first blocked step is also reproduced. More generally, two runs with the same initial internal response, the same letters and the same supplied input sequence have equal partial outcomes by induction on the steps.

This result does not make the input sequence predictable from y . The pair separated by the long chain word has the same early interface inputs but different later ones after the upstream difference

reaches position $m - 1$. Predicting those later inputs without further information restores the upstream dependency problem. The open account therefore answers a conditional question: what does the target do when this interface input is supplied? The autonomous refinement answers the stronger question of carrying all declared future target responses from one sufficient initial record. Both can be useful, but a comparison must acknowledge the difference in responsibility.

The result also clarifies the status of boundary enlargement. Adding all upstream positions to a purported language is unnecessary for the conditional account. Retaining the coupled profile p_* is sufficient for this model's autonomous task, yet that profile itself need not define a linguistically meaningful region. Deciding whether the relevant interfaces constitute one formation, link two formations, or belong to a wider support architecture requires the historical and explanatory arguments of the paper. The calculation identifies what an operational claim costs; it does not settle that ontological classification by coding choice.

7.8 Boundary Evidence Requirements

The worked construction supports a specific revision practice. Begin with the candidate record and criterion, state the operation responsibilities claimed for their profile, and locate an actual failure of applicability or successor consistency. A proposed repair can then be evaluated by its effect on the same responsibility. The chain demonstrates one such repair through a sufficient coupled profile and another through an explicit interface input. It does not rank all possible repairs or prescribe a recovery policy.

An empirical application would need evidence for the response distinctions, the gates, the update interpretation and the availability of the observations. In particular, identical written labels at different positions do not establish that the bits represent the same linguistic contrast. The realization maps of Section 6.1 retain that separate burden. Likewise, a participant's inability to elicit a correction is not automatically evidence that its abstract operation is undefined. Technical access, social standing, willingness, and missing knowledge can produce different explanations of the same failed attempt.

The refinement is exact only within the supplied finite carrier and repertoire. A changed interface, a new operation, a revised interpretation or a newly recognized distinction can invalidate its earlier sufficiency. Those changes should remain visible as revisions of the task or carrier, with historical correspondence supplied where needed. The inherited field framework already permits changed continuation families and operation-descendant correspondences rather than requiring every novelty to fit one fixed menu [11, pp. 55–57]. The present finite proof does not automatically extend to such changes.

Finally, operational equivalence and historical individuation can disagree without contradiction. Two differently formed practices may have the same refined response profile; a continuing formation may acquire a different one. A favorable refinement result therefore supplies a bounded component of an individuation argument: the proposed description can carry the declared operations with explicit support responsibilities. Its historical witnesses, empirical interpretation and classificatory authority remain additional questions. This separation preserves both the positive use of the model and the wider philosophical object that motivates it.

7.9 Regional Observable Dynamics

The construction can be extended beyond the single-edge example while preserving its regional meaning. Return to the product field on G . For each finite subgraph R , a bounded function on $\mathcal{F}_G(R)$ becomes a function on Ω_G by composing with coordinate restriction. These are the observables supported on R ; write their algebra as $\mathcal{A}(R)$. If $S \subseteq R$, coordinate restriction is surjective in this product model, so pullback gives an injective isometric algebra map from $\mathcal{A}(S)$ to $\mathcal{A}(R)$. This direction is opposite to field restriction.

Finite subgraphs form a directed family under finite union. Equation 36 defines a norm-complete

algebra containing the finite-support observables.

$$\mathcal{A}_{\text{ql}}(G) = \overline{\bigcup_{R \subseteq G \text{ finite}} \mathcal{A}(R)}^{\|\cdot\|_\infty}. \quad (36)$$

The union in Equation 36 is taken after the compatible embeddings into bounded functions on Ω_G . It is a $*$ -algebra because any two finite supports lie in their finite union. Its closure is a commutative C^* -algebra. For an infinite graph it need not contain every bounded function on the full configuration space. The construction retains observables approximable by finite regional ones, without postulating a tensor decomposition of linguistic individuals.

The update U_e enlarges observable support only to the dependency neighborhood already defined in Section 6.3. Equation 37 states the resulting inclusion.

$$\alpha_{U_e}(\mathcal{A}(R)) \subseteq \mathcal{A}(N_e(R)). \quad (37)$$

To verify Equation 37, take an observable depending only on the coordinates of R . After composition with U_e , its unchanged coordinate arguments still lie in R ; if the target coordinate is among them, its new value requires only the added source and interface coordinates in $N_e(R)$. Thus every argument needed for the composed function belongs to the stated neighborhood. Contractivity from Proposition 7.2 extends the map uniquely from the union of finite-support algebras to its norm closure.

The full regional construction can therefore support a well-defined operation even when $\mathcal{A}(R)$ alone is not invariant. This is the algebraic meaning of an open regional description in the example. The failure of closure at one chosen boundary is compatible with a coherent larger model. It motivates inspection of the missing interface rather than an immediate conclusion that the selected region has no linguistic unity.

The injective regional embeddings here depend on the product field's surjective restrictions. More constrained field structures may exclude some local configurations from global realization. Their restriction maps then need not be surjective, and the induced pullback need not be injective. The general field framework requires those conditions to be checked rather than importing this example's algebra net unchanged [11, pp. 18, 29–31, 40–43].

7.10 Historical Observable Retention

An evolving historical carrier requires a further distinction between retaining an old record and retaining the current response it once described. Suppose Ω_K and $\Omega_{K'}$ are carriers of admissibly labelled histories, with K' extending a selected anchor K . Let $\pi : \Omega_{K'} \rightarrow \Omega_K$ forget the new historical part. If every admitted old history has at least one admitted extension, π is surjective and π^* embeds the old observable algebra in the new one. When this extension property fails, the old carrier must be restricted or the failure of injectivity retained explicitly.

For a chosen extension operation $U : D_U \subseteq \Omega_K \rightarrow \Omega_{K'}$ satisfying $\pi U = \text{id}$ on its domain, the old-record retention identity is Equation 38.

$$\alpha_U(\pi^* a) = \mathbf{1}_{D_U} a \quad (a \in \mathcal{A}(\Omega_K)). \quad (38)$$

Equation 38 follows by evaluating $a(\pi U \omega) = a(\omega)$ on D_U and applying zero extension elsewhere. For a total extension operation it reduces to exact retention of the old observable. This is a bounded-function instance of the inherited historical anchor architecture, rather than a new preservation theorem [11, pp. 46–51].

An observable of the response at the latest layer of K' need not lie in the embedded old-record algebra. Its value can change as new events occur, even while every retained old occurrence remains available for historical comparison. Likewise, a later assessment of an old event can change unless the evaluation itself is included in the preserved structure. Algebraic retention of an anchor does not freeze subsequent interpretation or establish uninterrupted active practice.

The operator analysis thus contributes a precise limit to a proposed individuation argument. A record can support a static comparison while failing to retain execution conditions or the distinctions needed for its asserted dynamics. Enlarging the record can remedy that specific failure, but historical continuity still requires its declared witnesses, empirical application still requires evidence, and institutional recognition still requires its own justification. These obligations remain separate even when one model represents all of them.

8 Historical Boundary Cases

Historical cases test whether an individuation account preserves distinctions that matter to linguistic explanation. This section considers cohort differentiation in Nicaraguan Sign Language and the historical connections involved in Miami language reclamation. The empirical sources concern particular practices and observations; the argument developed here concerns the kind of unit those observations can warrant. Constructed branching and overlap cases then isolate inferences that the empirical studies themselves were not designed to test. The resulting comparison connects the historical structures of Section 5 with the evidential obligations developed in Section 9.

8.1 Nicaraguan Cohort Differentiation

Senghas, Kita, and Özyürek describe increased contact among deaf Nicaraguans following the expansion of educational provision in Managua in 1977 and 1981. Their study compared motion descriptions from thirty signers, grouped by first exposure into three cohorts, with co-speech gestures from ten hearing Spanish speakers. All participating signers had begun exposure by age six. The sampled later cohorts more frequently expressed manner and path sequentially than the first cohort. The article interprets these differences within a developing language passed through successive cohorts [19]. These are selected production findings, accompanied by a historical account; they do not provide a complete description of each participant's grammar.

The individuation problem arises because historical connection and current structural agreement answer different questions. Suppose a comparison groups productions solely by whether manner and path are sequenced. That comparison can be appropriate for the linguistic variable being studied. It does not follow that the resulting groups identify separate historical languages. The same sequence pattern can occur in several participants, and a participant can use more than one pattern. Moving from a production classification to a language classification therefore requires a further account of how the productions participate in a continuing formation.

Conversely, grouping the observations under a common language name does not make their differences incidental. A historical explanation can require precisely the cohort distinctions that a uniform grammatical description suppresses. The relevant unit may organize the transmission and transformation of alternatives without assigning one invariant grammatical state to its participants. Its unity then concerns the history connecting differentiated contributions. Describing that history requires attention to who encountered which practices, when, and through which relations. It cannot be recovered from an average production profile alone.

The philosophical proposal is accordingly stronger than the permission to tolerate variation. Variation can enter the explanation of the formation itself: later practices develop through engagement with earlier practices, and the relevant history contains changes in what participants acquire and produce. A unit that includes these connections can explain a succession that descriptions of isolated outputs leave unrepresented. This explanatory use remains conditional on the quality of the historical evidence. The common heading of a study is evidence of its adopted object; it is not an independent proof of the object's complete boundary.

Two rival interpretations remain available. A cognitive investigation can compare the competences of individual signers, treating the cohort grouping as an explanatory variable. A historical-social investigation can follow the connected formation through those differentiated competences. These investigations

need not select the same units. A conflict emerges when either description is made to settle the other's question without the necessary bridge. Individual differences do not by themselves establish several historical languages; a shared history does not establish one psychological grammar.

The case also clarifies collective efficacy. A continuing formation can make learning materials, interlocutors, expectations, and opportunities available to successive participants. Those effects occur through particular activities and capacities, including individual invention and initiative. Collective explanation identifies how their arrangement matters; it does not posit an additional speaker who designs the whole language. Nor does the case establish that every feature originated collectively or that the contribution of each participant was equal. The account is compatible with significant asymmetries of initiative and influence.

Finally, the individuation argument is narrower than the article's proposed explanation of language acquisition. The reported comparisons bear on a selected construction and a selected population. Choosing between general theories of innate learning capacities, interaction, and cultural transmission would require a wider evidential argument. Historical individuation can use the documented differentiation without treating that larger debate as settled.

8.2 Miami Reclamation Lineage

Leonard's 2011 account describes Miami language reclamation from the standpoint of a community participant and linguist. It relates a period of greatly reduced use to subsequent learning from documentation and renewed contemporary practices. Its dispute with the historical label *extinct* concerns the classification's fit with those activities and their community setting. The account explicitly notes that a later edition of the classification source had already changed its treatment; the dispute should not be projected unchanged onto present institutions [15, pp. 135–141, 155–156].

Leonard's later account describes a Miami workshop and reports how members of the Baldwin family learned through historical documentation and developed home use. It also records differences over the implementation of language work alongside shared commitments expressed by the participants discussed [16, pp. 28–32]. Neither account is a census of every Miami person's interpretation. Their relevance here lies in the historically connected activities that a classification based only on uninterrupted first-language transmission can overlook.

A precise individuation account should separate at least three claims. An earlier practice and a later practice can be connected through documentary derivation. Participants can maintain or renew social relations to the history represented by those documents. A later activity can also realize linguistic capacities that resemble, transform, or selectively recover earlier capacities. These claims can support one another, but their warrants differ. Documentary lineage is supported through the provenance and use of sources; social lineage involves histories of affiliation and activity; a capacity claim requires evidence of the relevant understanding and performance.

The philosophical significance of the combination is that an interruption need not occur simultaneously in each relation. A period without a specified form of habitual use can coexist with retained documents and continuing histories of people for whom those documents matter. Later learning can connect these surviving relations with newly developed capacities. An account that identifies a language exclusively with a continuously operating population of fluent speakers will describe a termination and a new formation. An account that follows a broader historical formation can describe an interruption and renewal within a continuing lineage. The disagreement should identify the bearer and continuity relation at issue rather than treating the vocabulary of death or survival as self-interpreting.

The broader description has a substantive advantage when it explains why these documents, these participants, and these learning activities belong together in the history under investigation. It can represent how a practice is renewed through materials and commitments whose relevance precedes the new activity. This advantage does not make every historically inspired construction a continuation of the same language. The documentary relation must be established, the connection to the selected history must be explained, and the capacities attributed to later practice must remain open to assessment. An unrelated activity that merely borrows a name would require a different account, even if its outputs initially

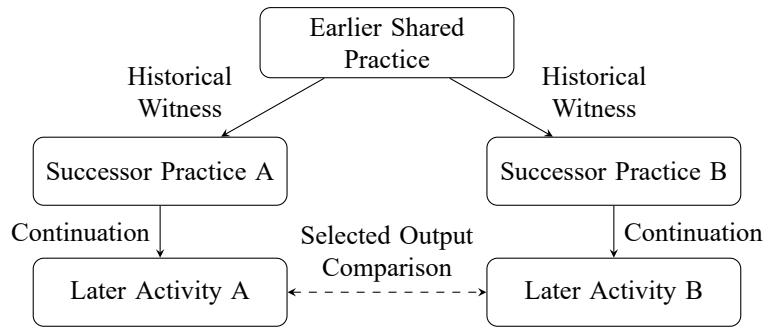


Figure 5: Constructed historical branching. Solid arrows record stipulated directional witnesses; the dashed line records a comparison of selected outputs. Neither common ancestry nor output agreement supplies an identity judgment about the successors. The arrangement is schematic and represents no measured community network or temporal scale.

resembled those under study.

The narrower description retains a legitimate use. A study of uninterrupted acquisition must record an interruption where it occurred. A study of a specific grammatical distinction must investigate whether later practice preserves, changes, or lacks it. Recognizing a historical formation supplies neither an answer to each grammatical comparison nor a guarantee of renewed transmission. The competing descriptions become misleading when their restricted conclusions are expanded into an unrestricted judgment that the language either vanished entirely or continued unchanged.

This coordination applies an existing GR distinction. The cultural-reconstruction manuscript treats reconstruction as a present configuration whose learning effects and historical warrant require separate arguments. The language-documentation manuscript likewise distinguishes the continuation of resources, capacities, practices, relations, institutions, and future options [8, pp. 7–8, 13–14][9, pp. 6–10]. The present use of Miami is to explain why selecting among these bearers changes an individuation claim. It does not offer a complete evaluation of reclamation goals or decide which curriculum participants ought to adopt.

8.3 Constructed Successor Formations

The following thought case isolates the relation between lineage and present grouping. A teaching practice develops two successor networks. Each uses materials and techniques derived from the earlier practice. Over time, the networks develop different correction conventions and support different recurring activities. Some participants remain active in both, and a shared translation practice enables selected exchanges. These stipulations describe an analytical possibility; they are not a further empirical claim about Nicaragua or Miami.

Figure 5 represents the central distinctions. Both successors can have historical witnesses to the earlier practice while supporting different later developments. Similarity between selected later outputs remains a separate comparison. The figure therefore preserves a common historical anchor without deciding whether the successors should count as one language, two languages, or overlapping formations.

The formal obstacle is inherited: an equivalence relation identifying both successors with the predecessor also identifies the successors with each other. Directed lineage can retain both historical connections while leaving that stronger identity claim open [10, pp. 29–30]. Its linguistic interpretation matters because a broad ancestral unit and a narrower later practice can each be relevant to a different explanation. A partition used as the complete representation of both relations either omits the shared lineage relation or collapses the successors' differentiation. A partition combined with separately typed lineage edges can retain both, provided the interpretation distinguishes their roles.

Overlap requires equal care. A person participating in both successor networks does not make the networks identical. The relevant overlap might concern participants, shared expressions, teaching rela-

Case	Supported Or Stipulated Relation	Remaining Individuation Question
Nicaraguan cohort study	Documented cohort differentiation within the authors' historical account	Which history connects the differentiated practices, and which question warrants treating them jointly?
Miami reclamation accounts	Documented learning, community activity, and historical classification dispute	Which documentary, social, and practical relations support the particular continuity claim?
Constructed successors	Stipulated common origin, differentiated continuations, and partial overlap	Which differences justify distinct later units while retaining shared lineage?

Table 4: Case-specific warrants for linguistic individuation. The first two rows use the primary studies cited in the text; the third is a thought case. None provides a universal language-counting rule.

tions, or an activity sustained jointly by both. These are different relations, and evidence for one should not silently establish the others. A bilingual participant's membership is not a proof that all distinctions travel across practices, just as a specialized translating interface does not show that the entire linguistic repertoires are interchangeable.

The GR treatment of thin nomic interfaces provides an inherited structural resource for this point: selected joint activity can become available while wider systems retain different organization [5, pp. 40–41]. Applying that resource to language requires an account of the actual mediation. If participants learn a shared expression, alter a correction convention, or construct a translation routine, the investigator must determine which relation has changed. The mere possibility of drawing a common interface supplies no historical evidence that it operated.

8.4 Comparative Individuation Questions

Table 4 identifies the different work performed by the cases. The table separates documented findings from the paper's constructed comparison so that neither receives the other's evidential status.

The cases support a positive research direction. A historical formation becomes an informative unit when its internal relations explain a pattern of continuity or differentiation that the chosen question needs to retain. The task is then to establish those relations and test competing boundaries. Treating variation as automatically destructive of unity, or common ancestry as automatically sufficient for unity, prevents that inquiry from beginning. The relevant alternative is a historically explicit comparison whose evidential and explanatory commitments can be examined separately.

9 Explanatory Warrant

A historical individuation specification becomes useful when it supports an explanation of linguistic activity that competing specifications leave incomplete or distort. Formal consistency establishes what follows within a representation; explanatory warrant connects the representation to the formation being investigated. This section develops that connection through the choice of an explanatory question, the identification of relevant dependencies, comparative evidence, and the effects of inquiry and classification. The general requirement for evidence-sensitive boundary selection is inherited from the GR metamodel [10, pp. 26–30]. The present task is to articulate its consequences for linguistic units.

9.1 Explanatory Unit Selection

Consider three questions about a changing practice: how participants understand an expression, how a pattern reaches later participants, and how an institution comes to recognize a named language. Each question can involve some of the same people and utterances. Their overlap does not make their explanatory objects identical. Understanding may require a fine description of individual capacities and the immediate interaction. Transmission may require a history of learning relations. Recognition may

require administrative categories, organized claims, and the practical consequences of adoption. A specification earns its scope by retaining the relations required for the question it undertakes to answer.

This dependence on a question does not make the answer a matter of convenience alone. A study can choose to investigate the transmission of a distinction; it cannot make an undocumented transmission link true by choosing it. It can select an institution's classification as its object; it cannot then infer that every activity assigned the same name has one grammar. Choice fixes the inquiry's target, while evidence and argument constrain the descriptions adequate to that target. The distinction leaves room for plural objects without removing the possibility of error.

A language-level formation is particularly useful when the explanatory relation extends across encounters, participants, and material supports. A current expression profile can describe shared forms while leaving their differentiated learning histories open. A list of individual capacities can identify who presently performs an activity while leaving the routes through which that activity becomes available to later participants open. A historical formation can organize those further dependencies. Its additional content must be demonstrated, however: a sufficiently enriched account of individuals and their interactions might retain the same history. Section 11 develops a worked comparison of the resulting explanatory commitments.

The argument does not infer an extra entity from the mere length of that list. A historical formation has work to do when relations among its components change the explanation: for example, when the source of a correction matters to its uptake, when a learning route determines which alternatives are encountered, or when earlier distinctions organize later interpretation. These are proposed mechanisms requiring investigation in a case. Their significance lies in the dependence they specify, rather than in the number of ingredients gathered under a collective name.

Explanatory scope can consequently vary with temporal depth. A short encounter may be described adequately through presently available capacities. A question about the formation of those capacities requires a longer history. Neither description automatically replaces the other. The historically extended object makes a further question tractable and prevents a current profile from silently carrying claims about its own origin.

9.2 Environmental Boundary Selection

A relational account faces an immediate boundary problem: linguistic practice depends on many conditions that an inquiry will not ordinarily include as parts of the language. Buildings, transport, nutrition, and funding can affect participation. Describing their causal importance alone would expand the unit indefinitely. The proposed response distinguishes an enabling condition from the historical linguistic organization whose activity it enables, while allowing the boundary to change where their coupling is itself the object.

Suppose two otherwise separate practices use rooms financed by the same institution. Shared support explains why both can meet. It does not by itself explain shared interpretation, common correction conventions, or linguistic transmission between them. An individuation argument therefore needs to say which coupling makes the broader grouping informative. If an educational arrangement also circulates teachers, stabilizes a shared standard, and connects later participants to earlier materials, the institutional relation can enter the explanation of linguistic organization. Its role is then more specific than general causal dependence.

This distinction is analytical rather than a claim that material supports are intrinsically external. A study of one conversation may treat a platform as an input condition. A study of how its formats establish recurrent correction and participation may include the platform's procedures within the formation. The choice changes what the model must explain. Including the platform does not make its entire ownership history constitutive of every language use; excluding it does not make its constraints disappear. The boundary must retain, or explicitly expose as an interface, the dependence relevant to the selected question.

The regional account in Section 6 sharpens this point. A region can admit a coherent descriptive profile while its subsequent behavior still depends on omitted interface conditions. The appropriate

response can be to enlarge the region or to represent external inputs. Failure of an autonomous regional model therefore need not show that the proposed language unit is unreal. It may show that the particular claim of dynamical sufficiency was too strong. Conversely, a conveniently closed model can omit the history needed for a linguistic explanation even when its equations are internally well behaved.

A useful individuation argument should consequently identify both the retained dependency and the cost of removing it. Would the proposed boundary erase a learning route, conflate different correction histories, or conceal the institution through which a standard becomes consequential? These questions concern explanations that can differ while their current output descriptions agree. They also prevent the inference that every causal influence deserves equal status inside the unit.

9.3 Evidence For Rival Boundaries

Evidence supports a boundary by bearing on the relations the boundary is intended to represent. Production data can show a distribution of forms; records and testimony can connect learning events; situated observation can reveal interpretation and repair; institutional materials can establish how names organize treatment. Their combination requires an argument about their respective objects. A group name written across all records does not independently verify the unity it helped impose on the archive.

The appropriate comparison is between rival descriptions of a sufficiently specified problem. Their adequacy can be disputed even when their literal claims are mutually consistent. Consider a constructed inquiry that undertakes to explain which participants can use an inherited distinction in a specified range of encounters. Its initial description identifies that activity without restricting participation to an accredited institution. The investigator nevertheless uses accreditation as the boundary of available linguistic use. When competent participants outside the institution supply counterinstances, restricting the meaning of available use to institutionally recognized use would protect the classification by changing the question.

The restricted claim might be true: those participants may lack institutional recognition. It would still fail to answer the original question about their capacity to use the distinction. The dispute therefore concerns the adequacy of the selected criterion to a shared explanatory task, not merely the consistency of classifications under different criteria. Revising the task can be legitimate, but the change must be acknowledged and its explanatory cost stated. A useful record preserves the earlier target, the evidence that challenged the criterion, and the reason for adopting a new scope. Section 11 examines a separate worked case in which distinguishing the tasks clarifies their respective commitments.

Some rival descriptions can be rejected. If a proposed unit assigns an invariant grammatical property that its own admitted observations contradict, the property cannot be attributed to the unit without qualification. If a continuity claim depends on a teaching link for which the source actually records independent reconstruction, the historical witness needs revision. If a regional explanation attributes a change to internal adjustment while an omitted rule determines access to the relevant activity, the explanation needs the rule or a justified account of its irrelevance. These are concrete failures, not merely departures from a preferred vocabulary.

Other comparisons remain underdetermined. A short record may be consistent with both a continuing practice and a reconstruction from shared materials. Absence of evidence for an intermediate link should then be reported as a limit on the supported claim. The investigator may have grounds for a more limited claim in that case—documentary derivation, partial succession, or acknowledged affiliation—without sufficient grounds for the particular continuity assertion under examination. These witness types form no universal ladder of strength: their implications depend on the claims and evidence actually specified. Distinguishing the types permits the supported result to remain available even when a further assertion is unresolved.

Discriminating evidence also requires contrast cases. If a proposed criterion includes practices connected only by a shared administrative label, a case with the same label but independent learning histories tests whether naming is doing excessive work. If a criterion excludes practices whenever some forms change, a well-supported transmission history with such change tests whether invariance is doing excessive work. These are possible research designs and philosophical comparisons. The present paper does

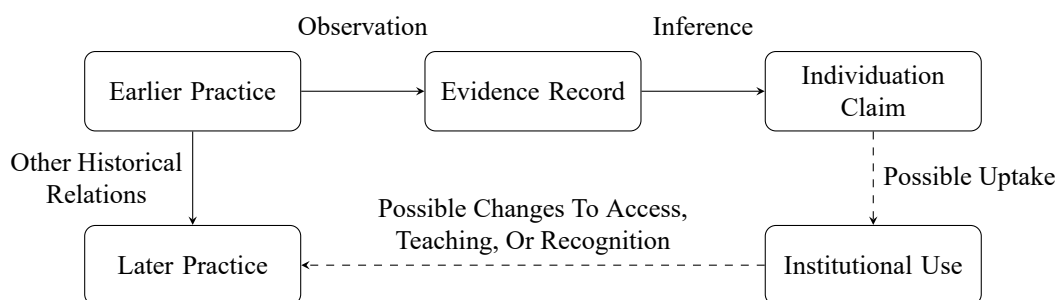


Figure 6: Inferential and institutional roles of an individuation claim. The upper route concerns evidence for a description. The dashed route represents possible effects of adopting that description. Later coherence produced through institutional use does not, by itself, verify the claim about earlier practice. All relations are schematic.

not report a new comparative dataset or claim that a particular test resolves every historical disagreement.

Robustness across reasonable specifications can increase confidence while remaining target-relative. A conclusion that survives altered sampling, a different account of a disputed link, and a modest change of regional boundary has a different evidential standing from one that depends entirely on a single selection. Such sensitivity analysis need not produce a scalar confidence score. It can identify exactly which historical or linguistic judgment changes the result and preserve the surviving alternatives for further investigation.

9.4 Classification Feedback

Linguistic classification can participate in the history it describes. Naming may influence curricula, access to materials, recruitment, or the recognition of contributions. These possibilities create two distinct evidential questions: whether a classification adequately describes an earlier formation, and whether its use helps organize a later one. Figure 6 separates the inferential route from that possible institutional effect. The dashed route is a hypothesis to be investigated in a case, not an assertion that naming produces every language boundary.

The distinction matters because retrospective confirmation can otherwise become circular. Suppose a programme selects one standard and subsequently organizes teaching around it. The resulting agreement may demonstrate an effect of that programme. Using the agreement to show that the earlier practices already formed one uniform language would require further historical evidence. A classification can become practically effective while its account of the prior situation remains incomplete. The GR distinction between contextual manifestation and relational efficacy makes these two assessments jointly available [5, pp. 15–16].

The converse deserves equal attention. An institution can adopt a name for a formation whose organizing relations already existed. In that case recognition may acknowledge, reinforce, or redirect an earlier history. Treating every institutional category as an arbitrary fabrication would obscure these possibilities. The research task is to reconstruct the temporal and practical relations among classification, activity, and uptake, allowing the direction and extent of influence to vary.

Inquiry itself can have formative effects. An interview can elicit reflection on a disputed distinction; collaborative analysis can teach an expression; a documentation session can establish a new occasion for use. These possibilities do not invalidate the resulting evidence. They change the claim it supports. Evidence of understanding after a collaborative reconstruction supports a claim about the resulting activity. Attributing the same understanding to the situation before the inquiry requires an additional basis. The source history should therefore distinguish earlier records, elicited performances, interpretive proposals, and subsequent uptake where the difference matters.

This is an application of the existing distinction between a present reconstruction and the historical object it concerns [8, pp. 7–8, 13–14]. It also explains why participatory inquiry can be necessary without

being self-certifying. Participants may disclose relations an external record omits, and investigators may contribute useful comparisons. Their encounter can revise the object specification. Warrant concerns the reasons and evidence produced through that process; participation alone establishes neither unanimous agreement nor the correctness of the resulting classification.

9.5 Revisable Explanatory Commitments

An individuation claim should remain connected to the commitments that make it informative. It should identify which linguistic activity is being followed, which history supports its continuity, which differences the representation retains, and which findings would require a different boundary. These commitments need not all be settled before inquiry starts. A provisional description can guide further investigation provided that its role is explicit and the evidence is allowed to challenge its grouping.

Revisability also has a substantive consequence for explanatory ambition. If several historically supported descriptions remain adequate, the result may be a constrained plurality of units. One unit can follow a broad formation across branching histories while another follows a specialized practice within it. Their coexistence is informative when each exposes a different dependency. It becomes an evasion when an account uses shifting criteria to protect an unchanged conclusion from criticism.

The present proposal therefore locates warrant in an articulated relation among the question, the historical-linguistic organization, the comparison structure, and the evidence. Its strength lies in making disagreements specific. Researchers can dispute a learning link, the significance of a correction practice, the scope of an institution's effects, or the suitability of an identity relation. Resolving those disputes requires the relevant linguistic and historical work. A formally coherent model organizes that work and derives conditional consequences; it does not perform the missing inquiry on its own.

10 Philosophical Objections

Historical language individuation remains vulnerable to substantive objections even after its formal choices are made explicit. A representation can be coherent while selecting the wrong object, importing its conclusion into its records, or obscuring the participants whose practice it describes. This section develops those objections and the conditions under which the proposed account can answer them. The responses defend a restricted explanatory role for historical formations; they do not establish that one GR representation should replace the linguistic and philosophical approaches examined in Section 2.

10.1 Alternative Linguistic Objects

The strongest individual-competence objection begins with explanatory specificity. People understand, produce, learn, and revise expressions through their capacities. A historical formation does none of those things independently of participants. If a theory of individual capacities and their interactions already explains the relevant observations, adding a language-level formation may simply redescribe its results. Calling the collective causally efficacious would then risk double counting the same processes.

The present account accepts the force of that test. A formation does not supply a second speaker or a substitute for an acquisition mechanism. Its proposed explanatory contribution concerns the historically organized availability and transformation of linguistic relations across participants. A learning route can depend on earlier materials, recurrent interlocutors, and differentiated correction practices. An account restricted to a participant's current competence can leave those dependencies unrepresented. A historical account makes them part of the explanatory object without asserting that they act apart from the activities through which they are realized.

Whether the broader unit improves explanation is therefore a substantive question. An individual-level model that retains the relevant interactions and histories may explain the same phenomenon adequately. In that setting the GR description may function as a coordinated representation or a different resolution, rather than an irreducible competing causal theory. Explanatory usefulness alone establishes

neither an irreducible collective entity nor a unique segmentation of the historical field. The defended requirement is to preserve the dependencies needed for the question; deciding where an adequate explanation ultimately terminates remains a further philosophical dispute. The paper supplies no general proof of the explanatory superiority of collective vocabulary.

An abstract-structure objection raises a related issue. Linguists can study a grammar, an interpretation system, or a class of structures without recovering the complete history of its realization. An abstract object can remain the same across different realizations, and distinct structures can appear within one historical practice. The usefulness of these objects is compatible with the present argument. Historical individuation asks which occurrences and transformations belong to a tracked formation; structural analysis asks which properties and relations an abstract description possesses. Their results may constrain one another without being identical.

The response should consequently avoid weakening the alternatives for rhetorical convenience. The conventional and historical-practice accounts examined in Section 2 already recognize substantial social, temporal, and heterogeneous organization. The further question concerns the warrant for particular historical boundaries and the coordination of the resulting units. The proposed contribution lies in that sustained coordination, its linguistic interpretation, and the consequences of its explicit representations, rather than in the general discovery that language has a social history.

The individualist can press the objection further. An account can represent each person's history, present competence, and relation to other participants without introducing a separately named formation. Once all relevant interactions are retained, there may be no explanatory remainder for the collective description. The paper should concede that possibility. The claim that isolated current attributes are insufficient does not show that an adequately relational individual-level account is insufficient. Failing to distinguish these objections would make an impoverished rival carry the argument for the preferred ontology.

The remaining question concerns the work done by an organizational description. Suppose the same practical pattern survives the replacement of several teachers: learners encounter differentiated examples, receive responses from persons occupying specified roles, and can consult a shared record when interpretations diverge. A description organized around the pattern can identify what continues through replacement and which altered relations explain a later failure. An exhaustive individual history may also contain those facts. The proposed gain is the explicit statement of their organization for the selected comparison, rather than an additional event that occurs outside the individual histories.

This gain is conditional. If every replacement changes the relevant organization, or if the named pattern groups interactions whose differences matter decisively, the formation-level description can mislead. Its explanatory adequacy must be tested through the contrasts it is meant to retain. A description that compresses several encounters is not thereby an adequate individuation of their history. The relevant continuity can depend on who taught whom, which record was inherited, or which role the replacement actually acquired. Organizational vocabulary earns its place by expressing those commitments, not simply by reducing the length of a description.

Nor does the collective description automatically distribute responsibility. A decision to close a teaching route may be made by particular people occupying particular offices. Explaining its effect through the arrangement does not remove the decision, its alternatives, or the decision-makers from the history. Conversely, an outcome can arise through interacting changes without one person intending the result. An account of responsibility needs further normative premises. The historical formation can retain relevant contributions and constraints while leaving that judgment open.

The objection therefore changes the defended claim. GR need not assert that the formation is the sole correct level of explanation. It can offer a historically disciplined representation whose organization makes selected dependencies and their transformations explicit. An alternative description that preserves the same distinctions remains a serious alternative. Where the two accounts agree completely at the level investigated, the paper has no basis for declaring a metaphysical victory for its vocabulary.

10.2 Boundary Circularity

A second objection concerns the selection of historical evidence. An investigator may begin by collecting records already identified as belonging to one language, construct a connected history from them, and then offer that connection as a derivation of the language's unity. The original identification has already shaped the domain. The later model can organize its consequences but cannot independently justify the initial selection.

The inherited metamodel identifies this problem explicitly and permits a more demanding reconstruction from provisional appearances and relational records [10, pp. 26–27, 30]. For linguistic inquiry, the point is to retain distinctions among an institution's record category, a participant's identification, an investigator's proposed connection, and the evidence bearing on that connection. A disputed name can be recorded as part of the history without being adopted as the rule governing every subsequent grouping.

Provisional records do not provide a completely interpretation-free foundation. Identifying a correction, a learning encounter, or a relevant expression already involves substantive judgments. The account therefore offers reciprocal constraint rather than an impossible derivation from neutral atoms. A proposed unit should explain the records, and the records should be able to force revision of the unit. Rival linguistic analyses, alternative historical links, and participant objections contribute to that constraint.

Circularity becomes objectionable when this corrective relation is blocked. If counterevidence is excluded because it comes from people already classified outside the language, the classification protects its own boundary. If a variant is admitted only after it has been declared a form of the target language, the record cannot test that declaration. A defensible study should expose such selection conditions and distinguish results conditional on them from conclusions supported independently of them. This requirement is compatible with restricted access and incomplete archives; it changes the extent of the warranted claim rather than demanding that every record become publicly available.

The joint-reconstruction case in Section 3 sharpens the response. Resolving whether the two Mara records concern one mentor can change the represented incidence of teaching relations. The investigator should not decide that identity from the desired formation boundary. Yet the identification cannot be made independently of every linguistic and historical interpretation: the record must be understood, testimony must be situated, and reference to another encounter must be assessed. The appropriate demand is that the warrant address the identification at issue and remain vulnerable to contrary evidence.

The objector may regard that response as merely relocating the circle. Reliability judgments themselves depend on a prior account of the participants and institution. The difficulty is real, but it does not make every mutually supporting interpretation equally adequate. A candidate can fit one label while contradicting dates, disregarding an explicit distinction between namesakes, or making the recorded correction unintelligible. Another can preserve those constraints while leaving the larger boundary unresolved. The difference lies in how much of the available, separately accountable record the reconstruction can explain without protecting its decisive assumptions from revision.

This is also why the framework retains a family of warranted reconstructions rather than promising a unique solution. Where both assignments fit the record, a claim dependent on shared mentorship remains conditional. The analysis can still establish what neither assignment disputes. An institution that needs a definite administrative category may choose one under a declared procedure, but that decision adds a practical settlement; it does not supply the missing historical evidence. Keeping those statuses distinct is a substantive answer to circularity, because it restricts the conclusions the preferred representation may claim.

10.3 Linguistic Boundary Expansion

The relational-expansion objection asks why the proposed object stops anywhere. Language learning depends on families, schools, technology, material conditions, and wider histories. Those conditions depend on others. If dependence is enough for inclusion, the formation grows into an indefinitely extended social world and ceases to distinguish the linguistic question that motivated it.

The response developed in Section 9 makes the relevant explanatory relation explicit. A study of a

correction convention retains the activities and histories through which the convention becomes available and consequential. It may represent other dependencies as conditions or interfaces. A study of the institutional reproduction of that convention may require a larger object. Neither boundary is fixed by general connectedness alone. What matters is whether the distinction between retained organization and represented surroundings permits an adequate account of the selected activity.

A boundary can remain porous without becoming arbitrary. The constructed successors can exchange expressions while sustaining different learning and correction arrangements. A shared activity may require a joint description even when other activities remain differentiated. Overlap then identifies a relation with a particular scope, rather than a reason to join all participants into one undifferentiated unit. This response also permits exclusion from a proposed unit where the alleged connection has no demonstrated role in the explanation.

Linguistic specificity places a further constraint on formalization. A field or algebra does not become linguistic solely because its variables are attached to speakers. The interpretation must explain what the selected states, operations, restrictions, and observations represent in language use. If the same formal construction could be applied unchanged to a transport schedule, the mathematical result may still be useful, but its linguistic significance requires a separate argument. The regional and operational constructions in Sections 6 and 7 are assessed at that additional interface.

10.4 Plural Individuation Criteria

A purpose-sensitive account can appear unable to resolve disagreement. If one investigator counts a single formation and another counts two, each may invoke a different question. The account would then risk making every classification acceptable by supplying it with an accommodating purpose.

The proposed plurality is constrained in two ways. First, an inquiry must state what its grouping is intended to retain and use that commitment consistently. A criterion cannot alternate between common ancestry and current similarity merely to maintain a preferred answer. Second, its historical and linguistic claims remain answerable to evidence. A declared purpose does not create a missing relation, erase a contradiction, or make an unsuitable observation adequate.

Some apparent disagreements dissolve because they concern different objects. A shared historical formation and two present standardized varieties can be compatible descriptions. Other disagreements concern the suitability of those objects for the same task. The accreditation example in Section 9 shows how a consistent classification can omit competent participants whom the original inquiry undertook to explain. A philosophically significant objection to that omission does not require a literal contradiction inside the restricted model. Further disputes concern the historical claims themselves: whether a particular learning history occurred, whether a distinction has the claimed role, or whether an institutional intervention reorganized the practice. The account should expose each disagreement at its proper level without promising that the available evidence will resolve it.

Vague boundaries are also compatible with substantial explanatory knowledge. Researchers can have good grounds for a historical connection without a unique point at which a successor becomes a separate named language. Requiring a single precise division in advance can remove the very process being studied. Where a decision requires a count, the adopted resolution and its consequences should be stated. A decision can then be definite for its purpose without being misrepresented as the discovery of a uniquely given boundary.

10.5 Criterion Revision

A more demanding objection concerns changes in the criteria themselves. An account can appear revisable while adjusting its criterion whenever a preferred unit faces counterevidence. If a shared name initially warrants unity, common ancestry replaces naming when names diverge, and current coordination replaces ancestry when the historical evidence fails, the conclusion may survive every challenge by changing its grounds. Calling the criteria historical does not answer this objection. Historical origin explains why a criterion is used; it does not establish the criterion's adequacy.

Three kinds of revision should therefore be separated. A study can discover an omitted condition for the same task. It can change the task because a different question has become important. The participants can also transform the practice so that the original task or criterion encounters a changed object. These possibilities can occur together, but their explanatory roles differ. The first challenges a previously incomplete description. The second changes the claim being assessed. The third requires an account of what happened within the represented history. The preservation taxonomy's treatment of historically generated criteria supplies the inherited distinction between structural satisfaction and judgments about the appropriate specification [12, Sec. 13].

Suppose an inquiry originally asks which learners can use an inherited distinction in a specified exchange. It uses course accreditation as a proxy because every observed successful learner holds the credential. Competent unaccredited participants later challenge the proxy. If the original question remains, the boundary must be reconsidered or the counterinstances explained on independently defensible grounds. Replacing the question with which learners are officially recognized can produce a coherent study, but it does not vindicate the original proxy. The excluded performance remains relevant to the earlier claim.

Now suppose the institution changes the exchange itself by requiring a new formal declaration that only credentialed participants can make. An account of current authorized participation may then need the credential. The new rule does not retroactively show that unaccredited participants lacked the earlier competence. It changes an admissibility condition and possibly the practical object. If later observations alone are used to assess the earlier description, the intervention can conceal the limitation of the original criterion. Recording both the rule change and the previous counterinstance prevents that retrospective substitution.

A defensible revision consequently retains the earlier task, the evidence that challenged it, the new criterion, and the reason for the transition. It should identify which earlier conclusions survive. Sometimes the retained distinctions admit a clear translation into the new comparison. Sometimes the newer practice distinguishes cases the earlier record never captured. In the latter situation, the old conclusion can remain well-specified for its original resolution while failing to answer the new question. Inventing a precise retrospective classification would misrepresent what the record contains.

This discipline leaves room for substantial conceptual change. A participant objection can show that the original task excluded an important linguistic relation; a historical discovery can reveal that the presumed common formation was assembled retrospectively. The appropriate response may be to abandon the initial unit. Revisability is meaningful when the account permits that outcome, rather than merely providing additional descriptions around a protected conclusion. No formal choice of comparison relation can replace the reasons for accepting the revision.

10.6 Historical Continuity Objections

A strict continuity objection treats interruption as decisive. If the practice ceased to operate in a specified way, any later practice must be a newly produced object. Calling it a continuation may conceal the break and confer historical authority on a present reconstruction.

The objection is correct about the need to retain the interruption. Its stronger conclusion depends on which object ceased to operate. An embodied capacity, a recurring activity, a documentary chain, and a community's relation to a history can have different trajectories. A later activity can be newly realized and still possess a well-supported relation to an earlier formation. The historical relation does not turn the later event into the earlier event, or eliminate the need to investigate what changed.

The opposite objection is equally serious: common ancestry might seem sufficient to unite every descendant. The branching analysis rules out that shortcut. Historical descent can remain shared while later organization differentiates. Treating all descendants as one current language requires an additional criterion; treating them as wholly unrelated discards the common history. The framework permits a broad ancestral description and narrower successor descriptions while requiring clarity about the question each answers.

The Miami case illustrates the stakes of selecting a bearer, but the present paper does not adjudicate every claim of revival, authenticity, or ownership. Community affiliation alone does not settle the provenance of a particular expression. Grammatical similarity alone does not settle a history of belonging. A reconstruction can be evaluated for particular historical claims while participants' standing and interests remain questions requiring their own reasons. The language-unit analysis should not be converted into an automatic test of who deserves cultural recognition or permission to continue a practice.

A gradual transformation creates a further challenge. Each adjacent stage can have a well-supported relation to its predecessor, while distant endpoints differ markedly. If the adjacent relation is descent or transmission, composing it establishes a longer history under the appropriate witness assumptions. It does not establish equality of the endpoints' grammar. If it is an identity relation, transitivity has the stronger consequence stated in the metamodel. The investigator therefore cannot use the intuitive acceptability of each small change as a substitute for deciding which relation the chain represents.

The same point applies to historical anchors. An earlier document may be retained through every extension while the current practices branching from it become differently organized. The anchor supports a claim about historical connection. It does not ensure that a current operation remains available, that the document retains its earlier authority, or that every descendant belongs to one present linguistic unit. To ask which formation continues, the account must combine the anchor with the selected organizational and linguistic criteria. Where their implications diverge, the divergence belongs in the result.

There may be no uniquely warranted date at which a successor becomes a separate language. This limitation does not make the transformation unintelligible. An inquiry can identify the differentiated correction arrangements, altered transmission relations, and changing recognition claims through which the successor developed. A precise dating convention may be appropriate for a separate administrative purpose. The philosophical mistake would be to treat the need for a date as evidence that the historical organization supplied one independently of that convention.

10.7 Representational Authority

The power objection begins with the practical effects of classification. A language boundary can influence who is heard, which forms are taught, and which histories become legible. An account that describes such a boundary as relationally real may appear to ratify the authority that sustains it. Alternatively, an account that exposes its construction may appear to deny the reality of the language people claim.

Neither inference follows from the proposed descriptive claim. A classification can have substantial effects that make it an important object of explanation. The justification of those effects requires further premises. Equally, the fact that people and institutions helped constitute a formation does not make its relations imaginary. The analysis needs to distinguish whether an arrangement operates, which activity it organizes, whether its description is adequate, and whether its authority is justified. These questions interact without being interchangeable.

The response must also apply to GR itself. Representing a community's language through historical configurations does not show that the representation captures that community's understanding of language. A proposed translation can lose a distinction, misplace a relation, or assume a unit the participants reject. Recording the objection as another variable would document the disagreement; it would not answer it. An adequate interpretation must explain the disputed translation, permit revision of the analytical question, and delimit claims where agreement or evidence remains unavailable.

This requirement does not presume a single community voice. Participants can disagree over a name, a teaching practice, or the significance of a historical connection. The investigator should identify the relevant positions and relations rather than assembling a unanimous subject by definition. Respecting the practical ability to decline participation or contest the inquiry also requires arrangements beyond a formal refusal marker. The present paper identifies that limit on explanatory authority without purporting to derive a complete governance procedure from the individuation model.

10.8 Distributed Linguistic Contributions

A final objection challenges the language of collective formation. If a linguistic practice has a distributed history, descriptions of its collective efficacy can obscure the particular people whose work made it possible. A theory that denies a solitary creator might inadvertently make initiative, responsibility, or unequal dependence disappear.

Historical representation should preserve those differences. The claim that a formation is sustained through relations is compatible with a participant introducing a decisive expression, a teacher opening a new learning route, or an institution controlling essential support. The broader history explains how that contribution becomes available to others and is sustained, altered, or rejected. It does not distribute credit equally by definition or make personal activity causally redundant.

Nor does collective efficacy imply a common intention. Different participants can contribute to an arrangement for different reasons; some consequences can exceed or oppose their plans. The relevant explanatory claim concerns the organization and effects of their activities. Attributing a collective intention would require additional evidence and a theory appropriate to that claim.

These objections leave a bounded positive result. Historical formations can be legitimate linguistic objects when their represented relations perform demonstrable explanatory work, their historical claims remain evidentially constrained, and their boundaries preserve the distinctions needed for the selected inquiry. Their legitimacy at that level does not depend on homogeneous grammar, unique origins, or a universally accepted name. It depends on the argument connecting the proposed unit to the activity and history it is meant to explain.

11 Comparative Individuation Procedure

The preceding analysis permits a concrete form of comparison among candidate linguistic units. This section develops that comparison through one extended stipulated case, revisiting the successor configuration introduced in Section 8. Its purpose is to show what an individuation argument must actually decide and what it can leave open. The procedure connects explanatory questions, source records, historical witnesses, regional dependence, and the scope of the resulting judgment. It is a method of organizing reasons, rather than an algorithm that discovers a unique language boundary from arbitrary data.

11.1 A Shared Teaching History

Suppose two present teaching networks descend from an earlier common practice. The available historical record documents the earlier teachers, the materials they used, and the later establishment of the two networks. Current records include an expression list, selected learner performances, correction sessions, and the institutional names used for the courses. The networks retain many of the same expressions. Their correction practices have differentiated, but a mentor working across both networks can explain the differences and enable selected exchanges. These are stipulations of the example, including its documentary adequacy. They should not be read as a report about an actual community.

Now suppose an institutional change removes that shared mentoring route. Each network continues to use the same name and retains its materials. Some participants can already manage the relevant differences. New learners who previously depended on the mentor no longer have that route of explanation. Here a new learner is new to the present course or exchange, and can possess relevant prior learning acquired elsewhere. The case does not assume that every newcomer begins with the same repertoire. The case contains at least three kinds of persistence: retained expressions, historical descent, and institutional naming. It also contains a selected change in available mediation. Calling the whole situation either simple continuity or complete replacement would suppress the distinction the inquiry needs.

Begin with a determinate explanatory question: why can some new learners continue to participate in a selected exchange while others encounter an unresolved correction difference? This question does not ask how many languages exist in the case. It asks what unit and interface description can explain a particular continuation. A separate question concerns the provenance of a shared expression. A third

concerns whether the two institutional names should continue to receive common recognition. The comparison should keep those questions distinct long enough to determine whether they warrant the same object.

11.2 The Initial Evidence

The case can be assessed in stages without assuming that the investigator initially possesses every fact stipulated for the reader. Suppose the first accessible records contain the matching expression lists, institutional names, and selected learner responses. One expression, glossed here as *settled*, appears in both networks. The gloss serves the thought case; it does not claim an exact semantic equivalence to the English word. Selected correction notes suggest that one network uses the expression for wording accepted provisionally, whereas another uses it to mark completion of a specified review procedure. The records do not establish uniform use by every participant.

For the selected exchange, an adequate explanation enables a learner to identify the local use and distinguish it from a claim that further review is authorized. Understanding the expression and possessing permission to reopen a procedure therefore remain separate. This specification makes the case's linguistic target sufficiently definite for comparison without supplying a complete theory of the imagined repertoires. It also prevents successful compliance with a procedural instruction from becoming the sole measure of understanding.

At this stage, the expression-profile description supports the limited claim that the selected forms agree. The institutional description supports the claim that the courses receive a common name. The correction notes give a reason to investigate differentiated use. None yet establishes the common teaching lineage known to the reader, or the interface through which the different uses can become explicable to newcomers. Those conclusions require further records and interpretation.

The initial comparison nevertheless does useful work. The apparent sameness of the expression identifies the material whose divergent use requires explanation. The institutional grouping explains why records from both networks were assembled together. The investigator can retain those contributions while rejecting an inference from either to a single operative standard. The distinction between the record's usefulness and the scope of the conclusion prevents an early classification from deciding the later formation question by default.

11.3 Documentary Identification

Suppose the next evidence establishes the dated teaching history and the derivation of both sets of materials from the earlier practice. The stipulated adequacy of these sources supports a common lineage of the selected material. A proposal that the matching lists were independently assembled without the recorded teaching connection is now disfavored by evidence directed at that proposal. Current differences of use do not invalidate the lineage, because the documentary claim did not require invariance of every interpretation.

Current course notes also name a mentor as Mara. The investigator initially has two candidate assignments: one mentor working across the networks, or two mentors sharing the name. This is the joint-individuation problem introduced in Section 3. The first assignment permits a shared personal interface; the second supplies no such interface from the name alone. Neither the common institutional language name nor the already supported teaching lineage decides the assignment.

Additional dated records and situated participant accounts can address it. Suppose these sources establish that one person conducted the recorded sessions in both networks. The namesake assignment is then rejected for this case on its own evidential grounds. The result is definite but limited. The same person could teach two practices separately, without translating or relating their uses. Personal continuity therefore makes the mediation hypothesis possible; it does not establish the hypothesis.

A further record is needed for the proposed linguistic relation. A note that explicitly uses an example from one network to explain a disputed use in the other bears on the mediator's activity. Evidence that learners subsequently employ the explanation bears on its uptake. Joining the person records, interpreting

a cross-network teaching link, and assessing its consequence are three connected inferential steps. Their relation should not disappear into the single observation that one teacher appears in both groups.

The same procedure permits a genuinely unresolved result. If the additional identity records were absent or conflicting, both mentor assignments could remain admissible. Common documentary descent would still be supported, while the claim of shared current mediation remained conditional. A useful report would state the conclusions shared by the reconstructions and identify the continuations that depend on the disputed assignment. It would neither discard the established lineage nor fill the gap by choosing the interpretation that produces a preferred language boundary.

11.4 Interpretive Mediation Evidence

Now suppose recorded encounters establish a specific correction sequence. A learner treats the expression as closing every possible later review. Mara distinguishes completion of the particular procedure from the broader possibility of another discussion, using contrasting examples that the learner can examine. In a subsequent unfamiliar example, the learner explains the distinction rather than merely repeating the earlier answer. These stipulated details support the interpretation that a task-relevant linguistic difference is being learned and used.

Their evidential force exceeds that of an approved response in the initial example, but it remains bounded. The new performance does not establish complete mastery, permanent retention, or an ability to teach the distinction. A participant can also understand the proposed explanation while disputing whether it gives the best account of local use. Such disagreement would concern the interpretation or standard, rather than automatically demonstrating absence of competence. The relevant evidence includes what the participants distinguish and what their dispute is about.

For the availability question, the operative arrangement now has a specified structure. It includes a person able to relate the examples, access to the relevant records, an occasion for consultation, and a route through which the explanation enters the selected exchange. If access is limited to scheduled meetings, the explanatory claim retains that condition. A conversation that might be arranged someday is weaker than an available consultation for the learners and encounter under study.

The current-practice description with this interface has acquired an explanatory advantage over a description containing only the expression profile or official category. It retains the relation that the evidence identifies as carrying the explanation. The common-lineage description also gains a present connection: inherited material enters a documented interpretive practice. The resulting organization can be studied as a historically transformed formation. Its whole-language scale remains unsettled, because a specialized interface can make distinct repertoires mutually usable without unifying them.

There is a serious alternative to assigning the interface a separate formation-level object. An adequately detailed description of the learners, their histories, Mara's competence, and the documented interactions might retain exactly the same dependence. If it does, the present comparison does not refute that description. The organizational account makes a pattern explicit and can help follow it through replacement or loss. That gain is compatible with the individual-and-interaction account's adequacy; it establishes no extra collective cause.

The inquiry's own contribution must also be specified. If the investigator assembled the examples and prompted the explanation for the first time, the encounter would demonstrate achieved mediation in the new setting. Attributing that arrangement to the preceding period would need earlier evidence. In the main case, the records are stipulated to concern an already operating practice. The variant identifies the premise required for the historical inference and prevents a useful collaborative intervention from self-certifying its own account of earlier capacity.

11.5 Candidate Boundary Specifications

The first practical move is to preserve records before treating the grouping of those records as established. A teaching session, a document, a learner response, and an administrative entry can each receive a provenance index. Their contextual information includes what was recorded, when, by whom, and through

Candidate Unit	Retained Organization	Remaining Explanatory Obligation
Expression profile	Agreement among selected recorded forms	How learners encounter and resolve the correction difference
Common lineage	Documented derivation from the earlier teaching practice	Which mediation remains available to present learners
Local practice with an interface	Local correction relations and the shared mentoring route	Check that the relevant learner capacities and interface inputs are retained
Institutional category	Course naming and administrative treatment	Whether the named category retains the relevant teaching relation

Table 5: Candidate boundaries in the stipulated teaching case. The comparison concerns a selected learner-participation question, not the intrinsic superiority of one kind of linguistic object.

which interpretive process. The records are not assumed to be neutral or exhaustive. Their indexing makes it possible to revisit the grouping without losing the observations and testimony from which it was proposed. This applies the metamodel’s distinction between an appearance domain and an already individuated entity [10, pp. 26–27].

At least four candidate descriptions can then be stated. An expression-profile description groups matching retained forms. A lineage description follows the common teaching history into both successors. A current-practice description distinguishes the networks’ local correction arrangements while retaining the cross-network mentor as an interface. An institutional description follows the official course categories. Each has an intelligible object; none receives priority merely by being called the language description.

Table 5 compares the commitments of these proposals. The right column identifies the explanatory obligation remaining when a description is used for the learner-participation question. These obligations are relative to that question and leave other uses of the descriptions open.

The comparison changes an otherwise vague dispute into explicit claims. An expression-profile account can be challenged if it claims to explain the post-change difference while retaining no condition that differs between the relevant learners. A lineage account can explain why the materials belong to a shared history while remaining insufficient for present availability. The current-practice account gains explanatory relevance by retaining the mentoring route, but its historical boundary still needs the documentary witness. These assessments can coexist without contradiction.

They also permit an actual judgment. For the selected learner-participation question, a description that omits the evidenced interpretive route is incomplete unless it supplies that route as a condition or input. The current-practice account is therefore preferable to the unqualified expression-profile account for this question. The latter remains useful for comparing forms. The claim is neither that historical vocabulary automatically wins nor that every description is adequate for its own declared purpose. One description has failed to retain a relation required by the shared explanatory task.

11.6 Continuation-Sensitive Comparison

The next step is to test what the proposed retained record determines. Consider two stipulated configurations that match on the expression list and the learner’s recorded production. In one, the mentor-mediated explanation remains available; in the other, it does not. If the selected continuation is an exchange requiring that explanation, the retained profile alone fails to distinguish the configurations relevant to the continuation. The failure concerns the claimed sufficiency of that profile. It does not establish that the learner possesses no linguistic competence in the second configuration.

The distinction between availability and outcome is important here. In one model the encounter can still occur, but an unresolved difference changes its result. In another model the relevant teaching operation itself is unavailable because there is no admitted participant who can perform it. These are different accounts and should be tested separately. The partial-operation construction retains both possibilities: a

quotient description must respect the operation's domain as well as the selected result on that domain. Treating every absent operation as an ordinary zero-valued outcome would conceal this difference.

An inquiry could address the omitted condition in two ways. It could enlarge the represented region to include the shared mentoring arrangement. It could instead keep the local practice as its focal region and explicitly supply mentoring availability as a boundary input. The former represents a broader organization; the latter represents a linguistically useful open subsystem. Neither move proves that the two teaching networks are one language. The mathematical issue is whether the explanatory dependence has been retained, not which social name should cover its carrier.

The continuation refinement in Section 7.4 gives a positive construction for a restricted version of this problem. Once the relevant configurations, operations and interpreted observation are fixed, the finite model determines which additional distinctions its autonomous profile requires. The chain example retains coupled quantities rather than every upstream coordinate. Its open-input counterpart carries a different responsibility: it describes the selected response conditional on fresh interface information. Applied to the teaching case, these alternatives would separate an explanation that models the mediation arrangement's continuation from one that conditions on currently available mediation. Either description would still need evidence for its operation meanings and domain conditions.

The construction begins after a record interpretation has been supplied. Refining already indexed configurations cannot decide whether the two Mara records refer to one person, establish the documentary lineage, or recover an earlier consultation that was never recorded. Those are independent inputs to the candidate-record map in Equation 4. The formal construction thus contributes a determinate operational comparison within the staged inquiry while preserving the historical questions that give that comparison its linguistic significance.

This also clarifies why apparent autonomy can be historically misleading. If the mentor route happens to remain unchanged throughout an initial observation period, a model omitting it may predict that period successfully. The institutional change then exposes a dependence that the earlier record did not vary. The lesson is conditional: agreement over observed continuations does not establish agreement over every continuation admitted by a stronger claim. Choosing that stronger domain needs historical and empirical reasons; an arbitrarily enlarged space of imagined interventions is not automatically the appropriate test.

11.7 Learner Boundary Revision

The interruption creates a further test of the learner boundary. Suppose the investigator originally used course accreditation as a proxy for access to the explanation. Before the institutional change, sampled learners held the credential and reached the mediator through the course. Afterward, a credentialed newcomer lacks the consultation route, while an unaccredited newcomer retains understanding acquired through an earlier informal encounter and can explain the distinction to a peer. These are additional stipulations, not general claims about credentials or teaching institutions.

For the original availability and interpretation questions, the two cases challenge the proxy in different directions. Holding the credential does not guarantee the selected current access. Lacking it does not establish absence of the relevant understanding. The account should therefore retain actual access and learner history rather than identifying competence with the administrative category. This revision has a definite object: it changes the criterion used for the same bounded explanatory task.

An institutional defense remains possible, but it addresses another question. The credential can accurately identify officially recognized participation. If the investigator now adopts recognition as the research object, the change is legitimate only as an acknowledged change of task. It does not vindicate the original use of accreditation as a competence or availability proxy. Keeping the earlier question visible prevents a shifted definition from appearing to answer the counterinstances.

Now suppose the institution introduces a rule requiring the credential for a particular formal review request. Its operation changes institutional admissibility. The unaccredited participant may understand the expression and formulate a request while lacking authorization to submit it through that procedure. The new restriction therefore neither demonstrates a loss of linguistic competence nor retroactively es-

establishes that the earlier proxy was adequate. A record that distinguishes interpretation, access, and authorization can represent all three claims coherently.

The formal operation model clarifies the resulting commitments. An action can fall outside the admitted domain because a permission is absent. A defined interaction can instead produce a different outcome because its participants interpret the expression differently. A learner can retain an acquired discrimination even when the original route of acquisition has disappeared. Treating all three situations as a single failed performance would collapse the very differences that explain the case.

Criterion revision consequently yields more than an invitation to collect additional data. The accreditation proxy is rejected for the original questions. A differentiated representation is adopted. The institutional category remains consequential within its proper scope. The former classification is preserved as part of the inquiry's history, since it may explain the original sample and the exclusion of competent outsiders. The new account revises its conclusion while retaining the provenance of the earlier judgment.

No normative endorsement follows from the new admissibility rule's effectiveness. Its justification can remain disputed even when the institutional description is accurate. Likewise, understanding the expression does not itself confer the right to make every decision associated with it. Those questions require reasons about standing, authority, and the affected practice. The individuation account contributes by making the relevant relations visible, rather than deriving authority from the fact that a formal predicate has a particular value.

11.8 Historical Reassessment

The institutional change does not erase the earlier teaching history. The record can continue to support documentary and pedagogical lineage even as the current organization changes. Conversely, the persistence of a lineage does not establish that the same local capacity remains available. The historical-witness construction therefore has an independent role alongside the dynamical comparison. It identifies the mode of connection actually asserted and the records supporting it.

Suppose the networks later develop a new shared explanation without restoring the old mentoring route. The new arrangement may provide a functional response to the earlier difficulty while having a different organization. An outcome-centered comparison can judge the selected exchange successful. A history-centered comparison can distinguish the new arrangement from a restoration of the old one. Both judgments can be warranted if their claims are stated accurately. The account should not force a choice between declaring perfect restoration and denying all continuity.

Some changes may also require revision of the comparison criterion. If the new practice teaches participants to distinguish something the earlier record did not encode, applying the old profile unchanged can miss the relevant development. This is a reason to retain the history of the criterion itself: which evidence motivated it, which domain it addressed, and which new question required modification. A changed criterion must not be used retroactively to manufacture an invariant verdict. Where no justified comparison transport is available, the inquiry should report that limitation and preserve the different descriptions.

The result is a layered assessment of this case. The common teaching lineage is supported by stipulation. The current correction arrangements warrant differentiated treatment for the selected participation question. The shared name supplies evidence about institutional recognition. The expression profile supports its own limited comparison. A later repaired interface changes the practical continuation without settling every historical identity claim. These conclusions are informative even though they yield no single universal partition of all the records.

The reconstructed interface can also be assessed positively without requiring literal restoration. Suppose different participants organize a shared explanatory session, retain some inherited examples, and introduce new contrasts addressing the difficulty exposed during the interruption. The selected explanation becomes available again. The historical record identifies the surviving resources and new contributions through which that happened. A task-relative comparison can establish success while an organizational comparison records the changed distribution of roles.

This is an evidenced transformed continuation under an appropriate criterion. The earlier personal mentorship remains a different historical relation, even if its selected function is now provided jointly. Where the new examples introduce distinctions absent from the earlier record, some retrospective comparisons may remain undefined. An investigator should not classify poorly documented earlier encounters by simply projecting the new criterion backward. Supported descent, present success, and unavailable comparison data can remain parts of one assessment.

The event also leaves other research objects open. One successful explanatory session does not establish that further competent participants will be formed, that the new arrangement can renew its supports, or that its authority is accepted by everyone affected. These questions belong to the relevant further investigations. Their absence does not cancel the bounded result established here; it limits the claims to which that result can be extended.

11.9 Revisable Individuation Judgments

A final individuation report should state the explanatory question, the proposed object, the retained relations, and the supported historical mode. It should identify a serious rival description and explain the evidence or argument that favors the selected one for the declared purpose. Where several descriptions remain adequate, their plurality should be reported rather than hidden through a forced choice. This practice follows from the argument's epistemic commitments; it is not a new administrative standard imposed on communities.

For the teaching case, a warranted report could follow the broad historical formation while treating the two present correction practices and their changing interface separately. A study of one learner's grammatical competence could select a different object. A claim about recognition or resource allocation would additionally require relevant normative reasons and procedures. Nothing in the formal test establishes that the broader historical unit should receive one official label, or that the narrower units should receive separate funding. Making those inferences would require premises that this inquiry has deliberately left open.

Revision becomes concrete when the report states what would change its assessment. New source evidence might weaken the supposed common teaching history. New observations might show that the mentor route was dispensable for the selected learners. Participant testimony might reveal a correction practice absent from the initial records. A revised institutional account might show that two names were treated differently despite their apparent agreement. Each discovery bears on a particular commitment. The GR account contributes by making those commitments and their relations inspectable, so that revision can change the appropriate part of the account without dissolving the entire inquiry into uncertainty.

The sequence has rejected two substantive overextensions: the expression profile's supposed sufficiency for the selected interpretive continuation, and accreditation's use as the boundary of relevant understanding and access. It has also rejected one participant-identification assignment only when evidence addressed that assignment directly. The remaining plurality is consequently constrained. A broad historical formation and differentiated present practices with an interface can coexist as warranted objects, while a fully specified individual-and-interaction account can retain the same dependencies. The absence of a unique whole-language count is an explicit limit of the inquiry, not a substitute for the judgments it has actually established.

12 Research Boundaries

The inquiry has developed an account of the obligations attached to historical language individuation. This section identifies the remaining limits of that account and the work required to move beyond them. These limits concern the empirical scope of the cases, the adequacy of the formal realizations, and the relation between analytical objects and public decisions. They specify what the paper's arguments establish and what a further investigation would need to supply.

12.1 Empirical Scope

The paper reports no new fieldwork, participant interviews, longitudinal corpus, or empirical language classification. Its two developed empirical discussions use published studies for specific constraints on the argument. The Nicaraguan study concerns selected productions and cohorts. The Miami accounts provide historically situated reclamation perspectives. Their evidential value does not depend on treating them as exhaustive accounts of either formation. A comprehensive application would require further sources, participant engagement, and investigation of internal disagreements.

The constructed cases have a different role. They show how an inference can fail even when its initial descriptions are stipulated to hold. Their consistency supports that logical purpose. It does not establish the frequency, importance, or actual mechanism of the pattern in linguistic history. The interface examples accordingly motivate discriminating questions rather than estimating how often real boundaries omit consequential relations.

12.2 Formal Adequacy

The formal results concern declared carriers, partial maps, regional restrictions, and selected observable algebras. Their assumptions are strong enough to derive definite consequences and limited enough to require case-specific justification. Exact profile equality is not an empirical theory of similarity. A specified continuation family is not the set of every linguistically possible future. A historical witness in a representation still requires evidence for the relation it is interpreted to record.

The regional field construction represents local dependence, compatibility, and possible changes of interface. Its finite nonlinear specialization establishes a diagnostic possibility. It is not a calibrated model of language development. A richer application could require stochastic dynamics, learning rules, uncertain records, changing semantic categories, or different carriers. Introducing those structures would entail new interpretive and mathematical obligations. Their absence here limits the claims that can be made; adding them without such justification would not improve the account.

The operator representation likewise should be assessed by what it retains. Linearity of a pullback on functions does not make the underlying configuration dynamics linear. A classical commutative observable algebra can answer a specific distinction-retention question without establishing that all relevant linguistic organization has that form. Noncommuting operations can matter when order changes the selected history or result, but their mere availability does not warrant a quantum interpretation. The paper's formal pluralism leaves such further models open while maintaining the present derivations' scope.

12.3 Normative Scope

Historical individuation can affect how a practical disagreement is described, but the account does not determine legitimate recognition, authority over curricula, access to archives, or resource allocation. Those decisions require normative premises about participants, responsibilities, harms, opportunities, and procedures. Explanatory usefulness alone supplies no entitlement to impose a label on others. Equally, the normative importance of a continuity claim does not make every historical premise supporting it immune to criticism.

The framework can help such inquiries by separating the propositions at issue. It can distinguish a disputed lineage from a disputed authority, or a retained name from a retained capacity. That clarification is preliminary to the normative argument. Further work should preserve the distinction even where the questions must be addressed together in practice.

12.4 Further Investigations

Several unresolved problems follow directly from the object established here. One concerns how new local conventions acquire stability without presupposing a fully individuated common language. Another concerns how competence is reproduced across differentiated participants and changing supports. A third concerns how dormant or interrupted capacities remain historically connected to later reactivation. These

are different investigations because their explanatory targets differ. The present paper supplies a way to state their object assumptions; it does not settle their mechanisms in advance.

A further formal problem concerns comparison across changing descriptive languages. When participants revise the categories through which a practice is understood, neither an unchanged profile space nor a simple expansion of its coordinates may suffice. A satisfactory model would need justified transports, explicit failures of translation, and a record of what the new description makes available. The historical and regional framework identifies where that problem enters. It leaves its general solution open.

13 Concluding Argument

Historical language individuation concerns the warrant for treating changing linguistic activity as a unit through which explanations and comparisons can be made. The paper has argued that this warrant requires more than a shared name, a matching current profile, or a common ancestor taken in isolation. Each can support a determinate claim. Their coordination requires an account of the historical organization being followed and the explanatory task for which its boundary is proposed.

The GR contribution is a disciplined way of articulating that organization. Manifestations provide situated evidence; history-bearing formations retain relations whose consequences can extend beyond a single encounter; generative interfaces condition further linguistic activity and can themselves be re-configured through it. These commitments make historically consequential organization available as an object without turning a preferred mathematical representation into an ultimate ontology. They also leave individual competence, convention, historical practice, and institutional recognition available for their distinct explanatory work.

The philosophical construction places positive constraints on the proposed organization. A constituent role must contribute to the linguistic activity being characterized, while an excluded dependency must receive an adequate account as a condition or interface. Participant identities and relational incidence can be reconstructed together, provided that their evidence can challenge the proposed grouping. The mentor/namesake comparison makes this requirement concrete: common naming and shared ancestry do not settle personal identity, and personal identity alone does not establish interpretive mediation. Different records can support these successive claims without supplying a single exhaustive language boundary.

The formal investigations develop that comparison operationally. An explicit map connects a candidate formation criterion to the configuration profile being tested. Historical witnesses retain directed continuation, while regional dynamics and partial operation algebras distinguish availability from outcome. Applying inherited continuation refinement to a declared finite repertoire yields a coarsest sufficient operational profile. In the gated chain, that profile retains coupled response-and-interface quantities, and a longer operation word exposes a dependency invisible to every shorter probe. These are consequences of the specified model rather than inferences from observed linguistic frequency.

The open-boundary construction gives a second positive result. A local response can be represented exactly when the relevant fresh interface input is supplied, even though its unaugmented profile cannot predict the complete continuation autonomously. This distinction explains why repairing an operational account need not merge every dependent practice into one formation. The sufficient profile specifies an information responsibility; the input-dependent account specifies a conditional explanation. Historical individuation still determines which organization and continuation those descriptions are intended to follow.

The cases show why the distinction matters. Cohort differentiation can enter the explanation of a continuing historical formation rather than merely deviating from a uniform profile. Documentary and social histories can remain relevant when a selected mode of transmission is interrupted. Branching and overlap can preserve shared histories while supporting different present units. These interpretations require specific evidence. They are not universal permissions to assert continuity wherever a desirable classification would benefit from it.

The extended teaching case demonstrates that these distinctions can change a verdict. Evidence for

a usable mediation route defeats an expression-only explanation of the selected participation difference. Actual understanding and access defeat accreditation as their common proxy, while the credential retains its separate institutional meaning. New permission rules and a reconstructed interface then change the practice without retrospectively vindicating the earlier proxy. The resulting description follows a shared lineage, differentiated current arrangements, and their changing interface. An enriched individual-and-interaction account can preserve the same dependencies; the comparison establishes no additional collective cause.

The resulting position is a constrained plurality of linguistic objects with specific grounds for revision. A grammatical comparison, teaching history, current practice and institutional category can each retain warranted content. Their coexistence is informative when their claims and responsibilities remain explicit. A historical formation earns its explanatory role by making consequential organization intelligible and exposing serious competing boundaries to evidence. This preliminary account supplies that role for the cases and models investigated, while leaving broader language counts, recognition decisions and preservation obligations to their further arguments.

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